

FEATURING MICHIGAN

THE BIOLOGIST



Vol. XIX, No. 4.

April, 1938

THE LIMITATIONS OF SCIENCE—*Hatch*

PHI SIGMA

BIOLOGICAL HONOR SOCIETY

"The object of Phi Sigma is to promote interest in biological research. Although originally designated as an honorary biological research society, it should now be considered as a working guild of biologists interested in research. In effect, election to Phi Sigma should be an opportunity for better work, rather than merely election to an honorary society."

Mile Posts:

- 1915 March 17, Alpha Chapter organized, Ohio State University.
- 1916 May, Central Governing Body organized, BIOLOGIST first issued.
- 1917 June, last War-time BIOLOGIST issued.
- 1921 February, BIOLOGIST revived.
- 1924 December, First National Convention, Constitution revised, Washington, D. C.
- 1925 December, Second National Convention, First Scientific Program, Kansas City.
- 1926 December, Third National Convention, Second Science Program, Philadelphia.
- 1927 December, Third Science Program, Nashville.
- 1928 December, Fourth National Convention, Coat-of-Arms adopted, Fourth Science Program, New York.
- 1930 January, Council Meeting, Ritual Revised, Norman, Okla.
December, Fifth National Convention, Fifth Science Program, Cleveland.
- 1931 Phi Sigma Letters Registered, U. S. Patent Office.
- 1932 December, Sixth Science Program, Atlantic City.
- 1933 June, Sixth National Convention, Seventh Science Program, Chicago.
- 1935 December, Seventh National Convention, Eighth Science Program, St. Louis.
- 1937 December, Eighth National Convention, Ninth Science Program, Indianapolis.

Expansion:

The Constitution provides that: "An active chapter may be established in any institution of learning which requires for graduation the equivalent of four years of collegiate work, and which is equipped with facilities for research work. - - - Any petitioning group must be active for at least one year before it may be granted a charter."

THE BIOLOGIST

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Denver, Colo., April, 1938

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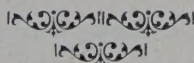
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DIRECTORY

OF ALL ACTIVE AND INACTIVE CHAPTERS

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ALPHA

Ohio State University, Columbus, Ohio, founded March 17, 1915, (Inactive).

BETA

University of Michigan, Ann Arbor, Michigan, founded June 3, 1916

DELTA

University of Maine, Orono, Maine, founded January 27, 1917.

EPSILON

University of Denver, Denver, Colorado, founded March 5, 1917.

ZETA

University of Wisconsin, Madison, Wisconsin, founded May 30, 1917.

ETA

University of Akron, Akron, Ohio, founded April 20, 1921.

THETA

Michigan State College, East Lansing, Michigan, founded April 9, 1921.

IOTA

Washington University, St. Louis, Missouri, founded May 28, 1921.

KAPPA

University of Kansas, Lawrence, Kansas, founded May 31, 1921.

LAMBDA

University of Montana, Missoula, Montana, founded May 4, 1921.

MU

University of California, Berkeley, California, founded April 27, 1922.

NU

Washington and Jefferson College, Washington, Pennsylvania, founded May 11, 1922.

XI

University of Nebraska, Lincoln, Nebraska, founded May 3, 1934.

OMICRON

University of North Dakota, Grand Forks, North Dakota,
founded May 26, 1924, (Inactive).

PI

Emory University, Georgia, founded January 3, 1925.

RHO

University of Illinois, Urbana, Illinois, founded March 28, 1925.

SIGMA

University of Florida, Gainesville, Florida, founded December 4, 1925.

TAU

Duke University, Durham, North Carolina, founded March 4, 1926.

UPSILON

Miami University, Oxford, Ohio, founded May 7, 1926.

PHI

University of New Hampshire, Durham, New Hampshire, founded May 21, 1926.

CHI

Montana State College, Bozeman, Montana, founded February 11, 1927.

PSI

University of Washington, Seattle, Washington, founded April 7, 1928.

OMEGA

University of Oklahoma, Norman, Oklahoma, founded March 24, 1928.

ALPHA ALPHA

University of Southern California, Los Angeles, California, founded May 17, 1930.

ALPHA BETA

Mount Union College, Alliance, Ohio, founded May 17, 1928.

ALPHA GAMMA

University of South Dakota, Vermillion, South Dakota, founded May 15, 1928, (Inactive)

ALPHA DELTA

Lawrence College, Appleton, Wisconsin, founded March 7, 1929.

ALPHA EPSILON

University of Pittsburgh, Pittsburgh, Pennsylvania, founded March 23, 1929.

ALPHA ZETA

College of William and Mary, Williamsburg, Virginia, founded April 19, 1930.

ALPHA ETA

Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma, founded March 13, 1930.

ALPHA THETA

State College of Washington, Pullman, Washington, founded May, 1930.

ALPHA IOTA

Bucknell University, Lewisburg, Pennsylvania, founded January 9, 1932.

ALPHA KAPPA

Hunter College, New York City, founded January 8, 1932.

ALPHA LAMBDA

University of Utah, Salt Lake City, Utah, founded February 13, 1932.

ALPHA MU

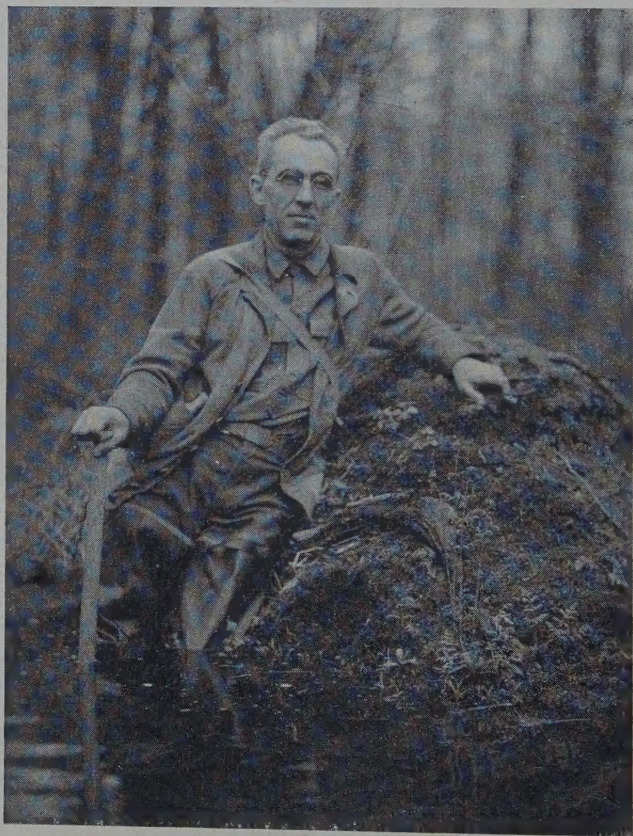
University and State Agricultural College of Oregon, Eugene-Corvallis, Oregon, founded November 18, 1933.

ALPHA NU

University of New Mexico, Albuquerque, New Mexico, founded April 21, 1935.

ALPHA XI

Rhode Island State College, Kingston, Rhode Island, founded May 17, 1935.



DR. F. N. BLANCHARD

DR. FRANK NELSON BLANCHARD

By WILLIAM E. STICKEL

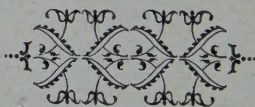
THE zoology department lost its most active research worker on September 21, 1937, with the death of Dr. F. N. Blanchard at the age of 48, from streptococcic septicemia. His early interest in biology led him to study and publish on both algae and insects, but all his later work was upon herpetology; he was among the world's few really fine scientists in this field.

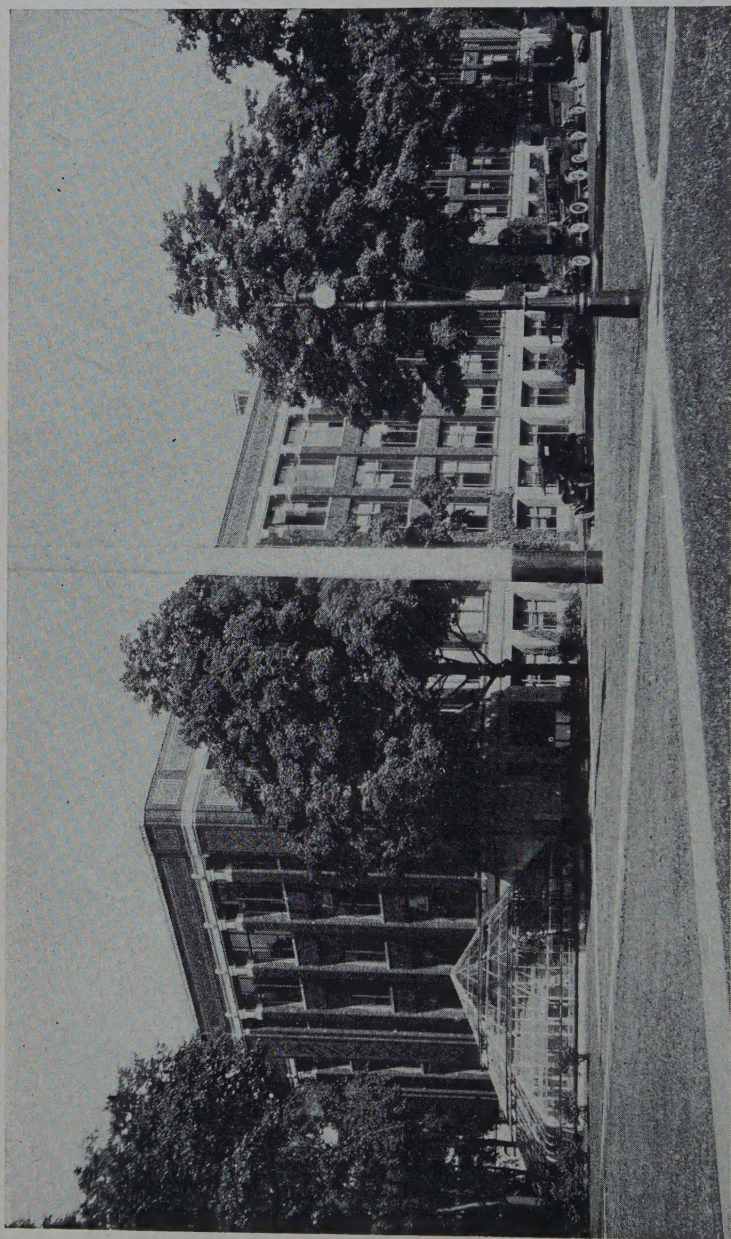
North American snakes were his especial study, and his work upon their life histories and systematics set new standards. His monograph of the genus *Lampropeltis*, the King Snakes, is one of the finest studies of intra-generic evolution yet published. Life history work done by him was characterized by the most critical scientific approach and the use of experimental and quantitative methods. Several papers of this type on salamanders have been published, but much of his research on the biology of snakes is yet to be summarized. At the time of his death he not only had about twenty-five research studies well under way, but with Dr. H. K. Gloyd had begun a book in which he planned to treat the snakes of this country monographically.

No manuscript of his went to print before he felt that it was as nearly perfect as he could make it from both scientific and literary points of view. This extreme of scholarly ambition was carried into his teaching, with the result that the time consumed in preparation for his classes probably halved his research. Despite the time spent on course improvement and his tendency to carry a project to completion regardless of the years involved, his bibliography con-

tains fifty-one titles. Dr. Blanchard's course in Vertebrate Natural History and Classification received the benefit of his careful attention and during the twelve years he taught it became known as the most thorough and scientific of its type. To have had it is now regarded as a privilege. At the University of Michigan Biological Station he taught beginning and advanced Ornithology courses, both of which were considered, by people in a position to judge, equal to any in the country.

He was retiring by disposition and tended to withdraw from those with whom he had no common interest, but few men have been more affectionately regarded and respected by their own students and personal friends.





Natural Science Building

BIOLOGICAL RESEARCH AT MICHIGAN

ALTHOUGH the Master's degree was conferred as early as 1849, and the doctorate in 1876, a Graduate Department was not instituted in the University until 1892. This department was separated from the Literary College in 1912 and from that time has operated as a separate School. In 1935 the Horace H. Rackham and Mary A. Rackham Fund provided for a separate building with lecture halls, reading rooms, discussion rooms, and rooms for various graduate organizations, and for a generous endowment to be devoted to the improvement of research in the School. This aim is accomplished by subsidy of research projects thru grants and by numerous fellowships. In 1936-37 these included 3 post-doctoral fellowships of \$2000 per year, and 10 pre-doctoral fellowships of \$1000 per year. In addition to these endowed fellowships there are issued each year about 125 fellowships and scholarships with values ranging between \$600 and \$100. Besides these fellowships, the various departments support numerous teaching assistantships and fellowships designed both for material aid to the Graduate Student and for supplying practice in college instruction. Those groups amenable to such subsidy annually receive grants from individuals, commercial organizations, scientific societies, philanthropic institutions and governmental appropriations. More or less detailed descriptions of the research activities in the departments from which Phi Sigma selects its members follow.

DEPARTMENT OF ZOOLOGY

From an humble beginning in 1838 when the Board of Regents named the later great Asa Gray as the first "Professor of Botany and Zoology", the Zoology Department of the University of Michigan has made steady growth. Zoology is divided administratively into five units: the Department of Zoology proper, the Biological Station, the Museum of Zoology, the Laboratory of Vertebrate Genetics and the subdivision of Forest Zoology in the School of Forestry and Conservation; all these units cooperate in zoological instruction but necessarily have varied facilities and research interests, which are described in their respective sections.

The Zoology Department proper is located in the northwest corner of the Natural Science Building, occupying 70 rooms distributed over

four floors. In addition to the usual class rooms, student laboratories and faculty laboratories, rooms are provided for aquaria, photographic work, housing experimental animals, light and temperature experiments, chemicals, charts and lantern slides and for preparations of various sorts. A centrally located departmental dispensary disburses all standard equipment, and a well equipped shop is provided for constructing departmental necessities.

The Department takes liberal advantage of the wide variety of ecological situations around Ann Arbor, including numerous small lakes, rivers, swamps and bogs as well as the various terrestrial situations for both instruction and research.

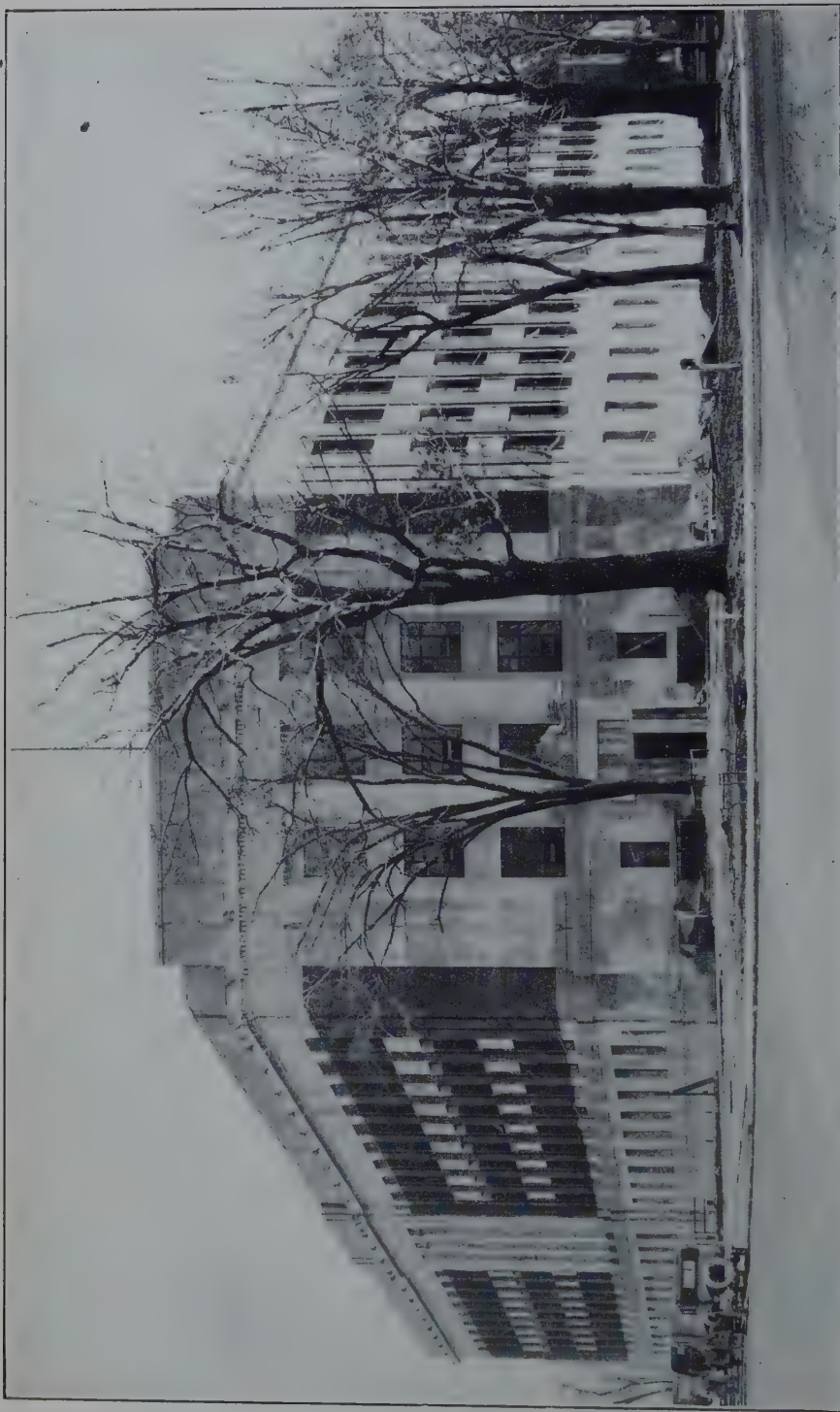
The Zoology Proseminars and Seminars and the meetings of the Zoology Club aid in keeping the student research worker abreast of the trends in the various phases of Zoology. Research in progress deals with parasitic protozoa; systematics and life histories of helminths; embryology of reproductive systems of snails, snakes and prairie dogs; effects of light and temperature on breeding cycle of mice; taxonomy, anatomy, physiology and life histories of reptiles; life histories and migration of birds; developmental genetics of aphids; respiration and biology of aquatic insects; plankton studies; stream biology and macro- and micro-bottom fauna.

Research in the Museum is mainly of a faunistic nature and is divided among the various groups of vertebrates and invertebrates. Current trends in the work are: *Mammals*—genetic analysis of subspeciation in peromyscus (Laboratory of Vertebrate Genetics); mammalian ecology in the southwest; life histories of small mammals of Michigan. *Birds*—Systematics of the South and Central American birds, with emphasis on those of Paraguay; systematics and distribution of the birds of the Big Bend country of Texas; and life histories of Michigan birds. *Reptiles and Amphibia*—Systematics and distribution of the reptiles and amphibia of the Americas. *Fish*—Systematics and variation studies in Atlantic and Pacific fishes, as well as more extensive work on freshwater fishes of the western hemisphere; lake and stream improvement for game fishes in particular, with a conservational attitude toward fish fauna in general; distribution of fishes in Michigan and many other states, including extensive work in the Tennessee Valley; and important genetic studies of hybridization and speciation. *Molluscs*—Effects of varying ecological situations on the systematics of the families Pleuroceridae and Amnicolidae, of the genus *Polygyra* and of the North Amer-

ican freshwater mussels. *Insects*—Systematics of Lepidoptera; life histories and systematics of Tipulidae; systematics of Odonata; variation, phylogeny and ecology of Orthoptera.

Several sub-divisions of the Museum have profited greatly by virtue of the cooperation of the Carnegie Institute in the study of the Mayan civilization of Central America.





Museum Building

The Museum

Michigan was the first State University to recognize the need of a museum building to centralize the research and educational functions of organized scientific collections. The first legislature of Michigan in 1837 specifically provided for a State Natural History Survey, and one of the first authorized departments on the campus was a Cabinet of Natural History. This came into being in 1842 and from it sprang the museum development it anticipated. The first museum building, on the campus, was completed in 1878 and housed the Museum of Zoology, the botanical collection, the ethnology collection, and the collections in geology and paleontology. The rapid growth and expanded activities in Zoology under Dr. C. C. Adams from 1901-1906 and under Dr. A. G. Ruthven from 1906-1927 led to the use of the entire original building by the Museum of Zoology and was the immediate factor in the recognition and development of the museum movement in the University.

In 1928 a modern museum building, The University Museums Building, was completed. This building, of 128,976 square feet floor space, now houses the University Museums, the Museum of Anthropology, the Museum of Paleontology, the Museum of Zoology, and the University Herbarium. The Museum of Classical Archeology and the Laboratory of Vertebrate Genetics are each housed in separate buildings.

With the exception of the University Museums, the function of which is exhibition, the museums at Michigan are primarily research and educational departments intrusted with the accumulation and preservation of scientific material and its study.

A central library of natural history books and periodicals is maintained in the building for the convenience of staffs and graduate students and in addition the several independent Museums have libraries in their respective fields. An inter-campus service is maintained in regard to books in the general library and other campus libraries. In addition the Museum of Zoology maintains extensive specialized libraries in each of its several divisions.

The research and reference collections are extensive and number many millions of specimens. These are properly and adequately housed for study and represent a hundred years of diligent and careful accumulations by gift, by inheritance, by exchange, by purchase, and by expeditions and explorations over the world. Included are many famous collections. The Bryant Walker collection of molluscs is probably the largest and most important single collection among many dozens such

as the Trowbridge Collection (Zoological), the Stevens Collection (Oriental Anthropology), the Lederer Collection (minerals and fossils), the Williamson Collection (Odonata), the Kaufman Collection (mycological) and the Steere Collection (zoology and anthropology).

One large hall is devoted to paleontology exhibits and a similar hall plus a mezzanine floor house the exhibition materials in zoology. In addition some hall cases and range space is given to display of specimens by the Museum of Anthropology. The exhibits are organized as visual teaching adjuncts to lecture and laboratory courses as well as for use by the general public and special groups.

There are established publication series in several of the museums, the oldest and most extensive are in the Museum of Zoology, which maintains four series, and the Museum of Paleontology. More recently established series have been established in the Laboratory of Vertebrate Genetics and the Museum of Anthropology. The University Herbarium series has been authorized but not yet initiated.

The majority of the staff members in the several independent museums offer graduate work either with the facilities of their museum or in cooperation with other University departments. A limited number of selected graduate students are allowed to carry on their major work under this arrangement. In addition two courses and special electives are given in museum administration and technique. The facilities of the Museum of Zoology are furthered by two organizations, cooperating with it and housed in its quarters, the Institute for Fisheries Research, established by the Michigan Department of Conservation, and the Great Lakes Division of the United States Bureau of Fisheries.

While the study of Michigan's resources in natural history is a major project in the several individual museum organizations, all deal with world problems and conduct explorations and investigations on every continent. This broad policy is fully reflected in the collections, libraries and research projects. The research activities are widely varied through numerous fields in the several disciplines of study, so that the museum activities in the University are cosmopolitan and comprehensive.

MUSEUM OF ANTHROPOLOGY

The Ceramic Repository with the collaboration of other institutions and field workers has available a large collection of materials for current research in the archaeology of the Eastern United States. The Ethnobotanical Laboratory is concerned with botanical remains from archaeological remains thruout the United States, and has established the time

of entry of many European plants from adobe bricks of an early Spanish Mission in Awatovi in Arizona. The Great Lakes Division through persistent study of Michigan material have established the presence of previously unknown prehistoric Indian Culture.

MUSEUM OF PALEONTOLOGY

The Museum of Paleontology comprises four subdivisions: vertebrate Paleontology, Paleontology of Paleozoic invertebrates, Paleontology of Mesozoic and Cenozoic invertebrates and Paleobotany. The collections consist of about 20,000 catalogued specimens of which more than 700 are types; these include one of the finest collections of Permo-Triassic reptiles and amphibia; vast collections from the limestone beds in northern Michigan, many of the specimens being types described by the late Dr. Carl Rominger; extensive material from the Mesozoic and Cenozoic invertebrate fauna of Mexico, and a wealth of Paleobotanical material. The vertebrate collections further include much recent material for studies in comparative osteology. The Museum has thoroly adequate facilities for preparation of fossils and employs one full-time preparator.

Each summer field parties are sent out by the Museum; in recent years their attention has been directed toward Mexican studies, supported by the National Research Council and the Geological Society of America; the corals of Michigan; Cambrian trilobites of Montana; Permian amphibians and reptiles of Texas and New Mexico; Oligocene mammals from the Badlands of Wyoming, Nebraska and South Dakota.

SCHOOL OF FORESTRY AND CONSERVATION

The School of Forestry and Conservation, whose research projects obviously must be of a very practical nature, may be divided into six rather distinct sub-departmental fields. They include land utilization, forest management and economics, forest pathology, silvics and silviculture, wood technology and forest zoology.

A field laboratory about three miles west of Ann Arbor, Saginaw Forest, has been available for research activities since its donation to the School in 1904. Eber White Woods and Stinchfield Woods, both near Ann Arbor, and Ringwood in the Saginaw Valley, bring the total available experimental woodland of the School to more than 600 acres.

The most intensive study of land utilization ever undertaken in the United States is now in progress in Cheboygan County, Michigan, under the Pack Foundation and as a project of the Institute of Public and Social Administration.

Current problems in management and economics are primarily those requiring cost and value research such as the most advantageous spacing of logging roads, the relative advantages of portable and permanent sawmills, and the most desirable method of logging for various sections of the country.

In forest pathology, a monographic work on the resupinate *Polysporus* of North America has involved intensive research throughout the United States, Canada and the Arctic regions. Other projects include decay in white cedar, the rusts of Alaska and the Yukon Territories, disease succession in forest plantations, the rots of northern hardwoods, resistance of introduced chestnut to the blight, and forest practice in Europe with reference to pathology.

State and National forests as well as private owners cooperate with the School in a varied program of silvics and silviculture, including such problems as growth and yield of natural forest types, relationship of specific gravity to seed viability, natural seeding in various forest types, pruning studies, and the effects of selective cutting.

The utilization laboratory, admirably equipped with timber-testing machines, a dry kiln and an experimental wood preservative plant facilitates both instruction and research in wood technology. Problems concerning machineability of wood, characteristics of tropical woods and effects of air conditioning on wood moisture content are being carried out.

The Bureau of Entomology of the U. S. Department of Agriculture cooperates with the Forestry School in many entomological investigations; some of these include work on the white grub, and on the biology and control of defoliators such as the walking stick, the larch sawfly and the spruce budworm. Other forest zoology work is concerned particularly with game animals. Current research is directed toward evaluation of forest wildlife and waterfowl environment, population studies, life histories and physiology of the wild turkey, ruffed grouse and mourning dove and coordination of forest practice with wildlife production. Lungworms of deer and *Leucocytozoa* of ducks are being investigated by the parasitologists. Investigations in economic zoology concern such problems as rabbit damage to Scotch pine; in addition, keys to feathers, hair, fur and seeds are being prepared for food habit studies.

In the rapidly growing forestry library which now subscribes to over one hundred scientific and technical journals, special efforts are being made to get those publications of greatest value for research in the various fields covered by the School.

DEPARTMENT OF BOTANY

Members of the Department of Botany have carried on intensive research in many fields. Taxonomic studies have been made not only among the lower groups of plants, including the algae, fungi, and mosses, but also among the flowering plants, such as the Cactaceae and the Rosaceae. The study of rusts and rust resistance, of the cytology and genetics of the genus *Oenothera*, of plant hormones, and of photoperiodicity have been notable at Michigan.

Facilities for research, such as constant temperature and refrigerator rooms, photographic equipment and dark rooms, and laboratories and offices of the department are located in the Natural Science Building. Well-equipped laboratories of plant morphology, cytology, plant physiology, mycology, plant pathology, microbiology, anatomy, taxonomy, and genetics are provided. In addition to the part of the Science Building which is assigned to the Department of Botany for research and teaching purposes, the Museums Building contains the Herbarium, with its well-equipped library, offices, and research rooms. The University Herbarium, which is under the direction of Professor E. B. Mains, contains about 300,000 specimens, with sufficient material for research in many groups. A relatively recent project is the study of the botany of the Maya region of Mexico and Central America.

The Botanical Garden, which is closely affiliated with the Department of Botany, offers excellent facilities for investigation in genetics, taxonomy, physiology, and pathology requiring the growing of plants in garden or greenhouse. The permanent plantings at the Garden provide much material for study and research which is made available to all qualified students. There are notable collections of Cactaceae, wild roses, plums, and other groups, and large miscellaneous collections accumulated by University scientific expeditions.

In the Department are three funds that provide for special departmental fellowships: the F. C. and Susan Eastman Newcombe Fellowships in Plant Physiology, the Emma J. Cole Fellowship and the Angeline Bradford Whittier Scholarship.

DEPARTMENTS OF ANATOMY AND PATHOLOGY

The Department of Anatomy comprises divisions in gross and microscopic human anatomy, embryology, and comparative and human neurology. A very fortunate state law allows the department an unusual amount of good human material; the neurology division possesses one of the few fine comparative neurological collections in the world, and

the embryology division has an extensive collection of comparative embryological specimens, and is setting up facilities for experimental work with living embryos.

The total staff of eighteen includes one teaching fellowship open to one of the graduate students in the department. Also available are the University scholarships and fellowships from the Horace H. Rackham Fund. Among the many anatomical investigations in progress may be included experimental and morphological studies of the central nervous system of the monkey, tissue culture and microcinematographic work on the initiation of heart beat in embryos, and research in tissue fixation which will result in a minimum of distortion.

The Department of Pathology offers ample opportunity for research among many lines. Apparatus and animal rooms are available for investigation in experimental pathology, while the materials from 18,000 surgical operations, and approximately 70 tissues from each of the 500 autopsies which are performed annually at the University Hospital offer an unusual possibility for research in morphological pathology.

West Medical Building



EAST MEDICAL BUILDING

The Department of Physiology in the Medical School was established in 1849, but it was not until 1881, with the advent of Professor Henry Sewall, that adequate equipment and space for teaching and research in Physiology was made available. The first department in the



East Medical Building

United States to offer a laboratory course in Physiology to medical students, the department here has grown with the times and holds high ranking as one of the better equipped and organized laboratories in the country, occupying four floors in one of the two wings of the East Medical Building. At present courses in General, Mammalian, and Human Physiology are offered to medical, dental, and physical education stu-

dents, and are opened to all having adequate training in biology, chemistry, and physics.

The total teaching and research staff of sixteen includes five teaching and research assistants, and five assistants who devote their full time to research. These students are either graduate students working on advanced degrees, or medical students who are taking a year or two off for research experience. The teaching and research group spend a portion of their time teaching in the student laboratories, and the rest of their time assisting the senior members of the staff on joint research problems. A generous grant from the Rockefeller Foundation has made possible the support of the full-time fellows, who are able to complete problems for advanced degrees during the course of the fellowship.

Since the appointment of Dr. Robert Gesell as Director of the Physiological Laboratories, the research motif has been studies in respiration and the control of respiration. Many problems dealing with the chemical and nervous control of respiration have been clarified, while still others are being investigated at the present date.

DEPARTMENT OF BACTERIOLOGY

Established in 1887 by special appropriation of the State Legislature, the Bacteriology Department of the University of Michigan is the second oldest institution of its kind in the world and is the oldest in the United States.

In 1926 the laboratory was moved into its new quarters which comprise three floors in the north wing of the East Medical Building and represents about 27,000 square feet of floor space. In addition to space for beginning and advanced classes, thirteen rooms are devoted to the research work of the staff, the assistants and others qualified to carry on special studies. The department is provided with eight hot rooms, six cold rooms and rooms for centrifuges, photomicrographic and other special work. The fifth floor provides space for the care of stock and experimental animals. A convenient departmental library is at the disposal of the workers and students.

Research activities at the present time include bacterial metabolism; cultural and anaphylactic tuberculosis studies; pathologic and therapeutic work on pneumonia; polyomyelitis; dental caries. Financial aid to the amount of \$13,000 from commercial concerns, the University and private donors in addition to the regular departmental allotment to research programs has made possible several of these projects.

DEPARTMENT OF BIOCHEMISTRY

The Department of Biochemistry, aside from being equipped for investigation in many biochemical fields, also owns a Pulfric photometer for the micro-determination of amino acids and lipids, and improved models of the Warburg apparatus for the investigation of tissue respiration.

The staff is composed of six senior members, seven teaching and research assistants and one full-time research assistant. The teaching and research assistantships are available to graduate students who are working for advanced degrees.

Investigations are being carried on in regard to tissue respiration particularly with respect to the influence of chemical structure on the de-amination of amino acids; lipid metabolism and the origin of amino acids; lipid metabolism and the origin of the sterols. enzymatic hydrolysis of the proteins; selenium intoxication; sulphur metabolism; inorganic metabolism, and the chemistry of dental caries.

DEPARTMENT OF PSYCHOLOGY

The Department of Psychology comprises a rather extensive plant for the study of both human and animal psychobiological research. Special apparatus is at hand for both acoustic and optic research in humans; the animal laboratories are well equipped with mazes, discrimination and reasoning apparatus as well as for experimental brain surgery and histological research. A complete and well appointed departmental shop is available for construction of special apparatus.

Among the research projects now in progress may be included: analysis of the maze in reasoning and learning in normal and decorticated rats; experimental neurosis in rats; effects of vitamins B1, B2, C and D in normal and pathological behavior of infants; racial differences in basic maturation patterns and development of sensory process in infants; relation between respiration and estimations of time intervals; redefinition of the concept of visual acuity with respect to its possible application in clinical tests of vision; comparative anatomy of the anterior segment of the vertebrate eye in relation to the ciliary body and the process of accommodation; experimental attack on the normal and abnormal functions of the human organism in various test situations from the biopsychological, developmental viewpoint.

Research in the department is supported by The Children's Fund of Detroit (infant studies), by special grants from the Horace H. Rackham School of Graduate Studies and by the regular departmental budget.

DEPARTMENT OF GENERAL LINGUISTICS

The Department of General Linguistics had its origin in the union of the activities of Professors Clarence L. Meader and John H. Muyskens twenty-five years ago. Researches during this time gave rise to many new conceptions of speech in its normal and pathological aspects. As a result of this intensive work, the Institute for Human Adjustment was established in 1937 through the Rackham Fund for continuation of this problem and for therapy in speech and auditory deficiencies.

The University of Michigan Biological Station

The University of Michigan Biological Station has been operated as a unit of the Summer Session since 1909; it occupies a forested area of about 4,000 acres at the north end of the Lower Peninsula of Michigan. This part of Michigan is a region of long glacial ridges separated by low, level areas in which are numerous bogs, swamps, lakes and streams and is in the transition zone between the coniferous forests to the north and the deciduous hardwoods to the south.

The Biological Station

The campus of the Station is situated on the south shore of Douglas Lake; buildings on the campus number 125 of which 8 are laboratories, 29 are for general service and 88 are cottages. Launches, boats, trucks, water and sewage systems, electricity and a good library, photographic rooms, aquaria, chemicals, scientific instruments and modern dining room and kitchen equipment are among the facilities which contribute to the attractiveness of the station.

The staff of the Biological Station includes five members from the University of Michigan and one member from each of seven other colleges and universities, specially qualified in the various types of work carried on at the Station. Eighteen formal courses are divided equally between zoology and botany, and investigations in those subjects are directed by staff members.

Each summer there are enrolled a number of investigators and about 20 undergraduate and 90 graduate students from some twenty-five states and foreign countries. The population at the Station totals about 200. Although the course work is of high quality and the combined researches of the staff, investigators and students results in about twenty-five scientific papers each year, a wholesome balance is maintained between work and recreation.

Because of its location in the transition zone and its consequently excellent variety of vegetal conditions, the region affords an unusual range of ecological situations, which present a rich fauna. Among the vertebrate animals 50 species of mammals, 175 of birds, 16 of reptiles, 14 of amphibians and 63 of fishes occur in the region. Excellent conditions for the study of many of those species are found in Wilderness Park, Lakes Michigan and Huron, and the smaller inland lakes. Most notable of the invertebrate animals are the land and water molluscs, smaller crustaceans, including the microcrustaceans, the sponges, polyzoans, hydra, nematodes, aquatic annelids, and insects. Parasites are extremely common in the animals of the region.

The variety of inland aquatic situations near the Biological Station is unusual, and Lakes Michigan and Huron are within easy reach. Their water, bottoms, beach pools, shores and islands make possible a great diversity of habitats. The numerous inland lakes range in area from a few acres to many square miles, and in character of content, from clear water to bog mats. They also present a diversity in character of bottom, shore line, depth and chemistry of their waters. Numerous streams covering a wide range of characteristics, and bogs and swamps in different stages of evolution further enrich the biological complex. The flora

of the bogs is northern and includes such trees as white cedar, tamarack, spruce and balsam fir, and numerous orchids, sphagnum mosses, the pitcher plant, sundew and dwarf mistletoe.

The extremely diverse flora contains more than 1,000 species of flowering plants in 400 genera and nearly 100 families. The ferns and their allies comprise about fifty species. Thirty genera of liverworts and more than 80 of mosses, totaling nearly 300 species have been collected. Six hundred species of algae, exclusive of diatoms, representing 160 genera, and more than 150 lichens have been recorded. A wealth of slime molds and fungi are yet to be studied.

Michigan Biologists



H. H. BARTLETT

Professor Bartlett came to the Department of Botany from the Bureau of Plant Industry at Washington more than twenty years ago; for many years he has been chairman of the Department and Director of the Botanical Gardens. He has been engaged particularly in the genetics of *Oenothera*, although his range of interest has included the collecting and systematics of plants from the East Indies and Tropical America, anthropology, pre-Linnean botany and several aspects of Oriental study. His professional engagements or personal field studies abroad have taken him twice to Sumatra, to Formosa, the Philippine Islands, Mexico and Central America. Concurrent with his systematic interests in the East Indies Dr. Bartlett's hobby is the study of Malayan languages. —M. L. J.

ROBERT GESELL

Robert Gesell, Professor of Physiology and Director of the Physiological Laboratories, began his studies in Physiology under Erlanger at Wisconsin, and accompanied him to Washington University (St. Louis) where he had previously taken his medical degree. Coming to Michigan from the University of California, where he was Professor of Physiology, in 1923 he was very active in enlarging and bringing up to high stand-

ards the physical equipment of the department. Although his main contributions have been in the field of respiration (the current theory of the chemical control of respiration bears his name), he has also made significant studies in cardiodynamics and circulation, nutrient flow of blood and shock, and submaxillary secretion. In spite of the time consuming job of teaching Physiology to the medical students, his enthusiastic attack on new problems and technical difficulties serves as an inspiring example to all of his students.

—J. M. B.

DR. ERMINE C. CASE

Dr. Case, head of the geology department is not only a paleontologist world famous for his monographs and numerous smaller papers on fossil fishes, amphibians and reptiles; for by those who know him he is immensely respected for his wit, breadth of learning, great knowledge of phylogenetic vertebrate anatomy and inspiring teaching. Most of those advanced students of vertebrate zoology or paleontology who take his course in vertebrate paleontology consider it the most fascinating and suggestive course they have ever had.

—W. H. S.



WALTER B. PILLSBURY

Having decided at an early age to enter the field of Psychology, Dr. Pillsbury acquired his training at Nebraska under Wolfe and at Cornell under Titchener. He came to Michigan in 1897 in the Department of Philosophy, and was shortly thereafter made Director of the Psychological laboratories, in which capacity he continues to the present. The wide scope of investigations by himself and his students, his diverse and voluminous publications, the growth of the Department of Psychology under his direction, his consistently open-minded attitude toward new trends of psychological thought and the enrollment in his classes indicate the wide range of abilities of this figure in American Psychology.

—H. C.



SAMUEL T. DANA

An executive with exceptional ability, a forester of national renown, and a capable director of research activities, Dean Dana of the School of Forestry and Conservation has won the admiration of all those who work under him, students and professors alike. Prominent among his many published papers are those dealing with the social effects of forests and with forest practice in the Northeast. Formerly the state forester of Maine, editor of the *Journal of Forestry*, director of the

Northeast Forest Experiment Station, and twice president of the Society of American Foresters, his influence on public opinion, on professional education, and in the field of research, has been outstanding.

—D. P. D.

A. O. LEE

Though Dr. Lee has no claim to fame in Biology, he has taken an M.D. in Germany and maintains an active interest in the History of Medicine which has resulted in a fine collection of historical items. His splendid loyalty to Michigan, as well as his undoubted mastery of medical history, has recently prompted an admiring Board of Regents to appoint him Professor of the History of Medicine. Up to now, as Professor of German he was the man whom every member of Phi Sigma met, not as an ordinary professor, but as a barrier to be hurdled—when he gave the language exams! His extreme kindness, sympathy and patience have made for him a warm friend of every student who has met him; this becomes most apparent by the turnout when he addresses our group.

—H. C.

G. CARL HUBER

"He represented the ideal college professor in that he was at once an excellent teacher, an eminent investigator, and a loyal and efficient member of the institution with which he was identified. His success as a teacher is witnessed by his students and gratefully remembered; the record of his achievements as a creative worker is permanently preserved in his writings, and his direct service to the University will long be reflected in its policies."



ALEXANDER GRANT RUTHVEN,
J. Comp. Neur., 1937.

JOHN HENRY MUYSKENS

Professor Muyskens is a pioneer in Biolinguistics in his emphasis of biological training for the appreciation of language processes. He was trained in Psychology, taught Physiology in the Medical School, was instructor in Romance Languages, and probably while in this field he turned to the study of phonetics, and has now established a large clinic for the study of speech disorders. To students and friends he is "John Henry", and to the strangers who dare to look twice, he is the "great big man with the beard." —F. D. M.





DR. CARL L. HUBBS

It is doubtful that anyone ever held a higher position of authority in ichthyology than Dr. Hubbs now has. Questions concerning American freshwater fish, in particular, are continually referred to him by scientists, and his knowledge of general fish classification and identification is apparently unrivaled. His publications number about two hundred and fifty, with more constantly appearing. Dr. Hubbs' work on the genetics of fish has shown several extraordinary situations, such as the species that is all female. Despite the tremendous amount of work always on hand and the scores of undescribed

species on his shelves he never refuses to see any student, preferring to make up the time while others sleep.

—W. H. S.



DR. E. B. MAINS

Professor Mains is widely known for his thorough and painstaking research in Mycology, particularly with the rusts. His investigations have followed three lines: firstly, taxonomy of rusts, with emphasis on those of tropical America; secondly, host specialization and the distribution of physiological races of rusts on the basis of host specialization; thirdly, rust resistance and the development of rust resistant plants, including ornamentals, such as snapdragons and iris, as well as wheat and other cereals. In connection with his scientific studies, as well as for a

hobby, Professor Mains is an expert photographer, and has exhibited his work on numerous occasions.

—M. L. J.



ALEXANDER G. RUTHVEN

Election to the Honorary Presidency of Phi Sigma attests the high esteem with which the society regards President Ruthven's scientific accomplishments. The field of zoogeography has acquired new significance as a result of his herpetological research, particularly in Central and South America; the introduction of the genetic concept into Systematic Zoology, beginning with his taxonomic revision of the garter snakes, has had an inestimable effect on systematic work in general. His pedagogical and administrative abilities are no less conspicuous, for during his long association with Michigan he has held positions as Professor of Zoology, Chairman of the Department of Zoology, Director of the University Museums and finally president of the University. —H. C.



GEORGE R. LaRUE

Dr. LaRue's clear perception of administrative and biological problems fits him admirably in his role as teacher and counselor. These qualities are recognized locally by his position as Chairman of the Department of Zoology and Director of the Biological Station, and nationally by perennial demand for his services in the A. A. S. and American Society of parasitologists. He has become one of the foremost American parasitologists by virtue of his life history and systematic work, particularly on proteocephalids and strigeids. In consultation with students he gives a fair and honest opinion on the question without introducing preconceived prejudice; although frankly outspoken, even caustic on occasion, he never retains an adverse opinion of the individual in consequence. These very facts have won for him the respect and affection of a wide circle of student friends.

W. H. S.

REUBEN L. KAHN

Dr. Reuben L. Kahn has been director of the University Hospital Laboratories and assistant professor in the Medical School since 1928. His work in immunology has been especially outstanding. The Kahn precipitation test for syphilis is used throughout the world, and in this connection Dr. Kahn participated in two meetings of the Serology Conference of the League of Nations Health Organization, at Copenhagen and at Montevideo. More recently, his interest has been centered on the mechanism of immunity, and in his laboratories an intensive study of tissue immunity is being carried on. His leadership in research has been an inspiration to his students.

—R. L.

DR. WILBERT B. HINSDALE

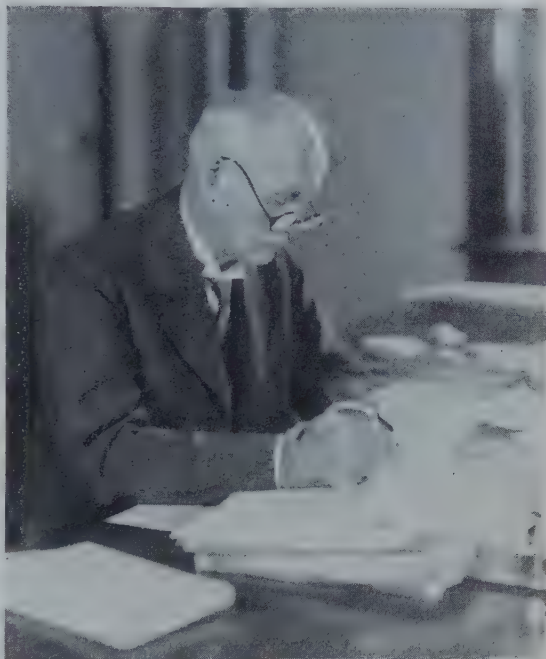
After serving as country schoolmaster and country doctor in Ohio for many years, Dr. Hinsdale came to the University of Michigan in 1895 as Professor of Internal and Clinical Medicine and Dean of the Homeopathic Medical School and Director of the College Hospital. In 1922 he was retired from medicine as Professor Emeritus, and then be-

gan the second phase of his career as Custodian of Archaeology in charge of the Division of the Great Lakes of the Museum of Anthropology. Even now at the age of 86, he is actively engaged in the study of prehistoric peoples of Michigan.

—G. Q.

FREDERICK G.
NOVY

In the 49 years of his University service Dr. Novy has impressed students and colleagues alike by the vigor and clarity of his mind, the range and accuracy of his learning, his forceful personality and pervading wisdom. He is now Professor Emeritus of Bacteriology and Dean Emeritus of the Medical School, with whose growth his name is inseparably associated. His training under Koch in Berlin, at the Pathological Institute at Prague and at the Pasteur Institute, combined with native



ability, have enabled him to make tremendous contributions to the field of Bacteriology. His reputation among fellow scientists and recognition by numerous learned societies mark him as the Dean of American Bacteriologists.

—V. Z.

JACOB E. REIGHARD

Although he became Professor Emeritus of Zoology in 1927, Dr. Reighard is still active in biological pursuits. Trained at the University of Michigan and later at Harvard, Dr. Reighard became an instructor at Michigan in 1886. As head of the Department, he was instrumental in its growth, bringing it from a "two-man" department to its present size. His principal contributions to science have been made in fresh water biology, principally fresh-water fishes. He is an excellent field

worker and conversationalist; his long list of sizable publications and the clarity and acuity with which he interprets biological phenomena mark him as one of America's great zoologists. —J. H.



HOWARD BISHOP LEWIS

After receiving his undergraduate degree and his Ph.D. at Yale in 1913, Dr. Lewis held teaching positions successively at Yale, University of Pennsylvania, and the University of Illinois until 1922 when he was made Professor of Biochemistry at Michigan. Besides ably fulfilling his teaching duties in the Medical School, directing Biochemical research, serving as Director of the College of Pharmacy, serving on the editorial boards of scientific journals, and on the executive councils of several scientific organizations, this energetic man still finds

time to carry out independent investigations of the metabolism of sulphur and in the synthesis of amino acids. Always anxious and willing to spend time in discussion with his students, the careful manner with which they attack their problems is a reflection of the vitality and enthusiasm with which he attacks his own research. —J. M. B.

A. FRANKLIN SHULL

Dr. Shull has made significant contribution to the problem of intersexuality through studies of developmental genetics in aphids and rotifers. In spite of a lengthy bibliography attesting his scientific ability, he has devoted a tremendous amount of time teaching. Besides being a pioneer in the application of the "principles" approach to elementary zoology, he has developed popular courses in heredity and the genetic mechanism of evolution as well as an advanced course in genetics. Among both undergraduate and graduate students he has earned the reputation of being a most lucid lecturer and sympathetic teacher.

—H. C.

The Limitations of Science

AN HISTORICAL SURVEY

By MELVILLE H. HATCH

SCIENCE needs no defense before a group of this sort. The day when Huxley had to fight for its inclusion in the educational system along with the list of English kings and the conjugation of the Latin verb has passed, if not for the people as a whole, at least for the present audience. We, engaged in scientific investigation, in the dissemination of science in the schools, or in its pursuit and study as an enrichment of our leisure do not need to be reminded again of its importance. The motor car, the medical center, the myriad evidences that surround us of our technological culture are likely to make us all too confident of the extensive nature of our scientific achievement. But "pride," you know, "goeth before destruction," so that it is, in part, to instill a little humility that I make my present remarks.

Now science has all sorts of limitations—most of which I intend to do no more than mention at this time.

There is, first of all, the limitation set by the scientist himself. It was Isaac Newton, I believe, who likened man's scientific knowledge to a candle set on the sandy shore of a great ocean, lighting up a foot or so on every side and leaving the rest in darkness. Since then, of course, Edison has invented the incandescent lamp and the Pyrex Glass Works of Corning, New York has cast the glass for the two hundred inch telescope, but still the known as contrasted with the knowable is of feeble extent.

Then there is the unfortunate limitation that the scientist sometimes has imposed on him by the intolerance of others. The beneficiaries of entrenched systems of all sorts, —religious, political, or economic,—at all epochs of human history, have attempted to prevent the dissemination of ideas which they have believed to be inimical to the perpetuation of their systems. The outstanding example of this was the imprisonment of Galileo by the Italian Inquisition in the seventeenth century. This action was, according to Bertram Russell, an extremely successful one from the standpoint of the Inquisitors, resulting in the effectual stamping out of science in Italy, the land of its rebirth, whence it was driven north of the Alps into France and England.

The advent of Darwinism witnessed another outbreak of intolerance by those who disliked the notion of man's animal ancestry or believed that its promulgation would tend to undermine the systems they were interested in seeing preserved. And there are still states in this country in which it is illegal to teach Darwinism in the public schools.

In the next place, there are the economists and sociologists. If they were to talk of the limitations of science, they would picture the poverty and misery that stalked through our land only a few years ago: hunger and malnutrition side by side with unsalable surpluses of wheat; unheated houses side by side with the richest coal fields in the world, idle for want of customers; unclothed children in the presence of surpluses of wool and cotton and idle textile mills.

And there are the political scientists and historians, who could depict for us a Europe and Asia on the brink of another war—a picture of a science turning out fearful and still more fearful weapons of destruction: guns, airplanes, poison gases—but impotent to restrain man from using them for his and its destruction. These are limitations of science to which all of us must give deep and serious thought.

Then there is the kind of limitation that the clergyman or theologian would be likely to develop if he were to attempt the discussion. This point of view was most completely and most adequately developed by the schoolmen of the eleventh, twelfth, and thirteenth centuries of our era: Peter Abelard, Albertus Magnus, Roger Bacon, and, first of all, Thomas Aquinas, the last still the official philosopher of the Roman Church. And the view is held today by countless cults, sects, and “isms” in all parts of the world.

There are, according to it, two avenues to truth. There is, of course, the method of observation, which is the method of science. But in addition to this lowly, halting, indirect approach, there is a higher, easier, royal road. If we simple uninitiated souls, however, seek to enquire into the nature of this approach we find that it is a multiheaded hydra, a veritable “old man of the sea,” impossible to corner and identify. Now it is a Upanishad, now a Koran, now a Bible that is supposed to provide us with the key to knowledge. Or it is a “Father Divine” in Harlem, a society lady in Boston, or a farmer in central New York State who has discovered the royal road to truth. Their very multiplicity warns one to caution.

Finally, there is the philosopher like Immanuel Kant. He shares with the theologian a dislike for being limited to the plodding method of observation and experimentation, but he is unwilling to believe that the

theologian has been successful in finding a way around. So he looks into his own inner self and, on the basis of the feelings of freedom, good, evil, and so forth that he discovers there, he comes to truths that are forever outside of and beyond the ken of science. For 150 years these have been the views of an important segment of the scientific world, and they correspond to the every day outlook of many of us here. Logical and rigorous in our laboratories or in our thinking and teaching in relation to science, we hang up these points of view with our laboratory aprons when we shut the laboratory door and sally forth—or withdraw, depending upon our point of view—into that inner—or outer—world of freedom and social relationships. Think not that I deery this—no scientist could remain sane if he were forever confined to a world of logical forms and necessary relationships. But, while I shall have something to say about Kant later on in my discussion, it is not this great important practical part of his teaching that I shall treat.

It is, then, of a limitation to science of a type other than any of these to which I would direct your attention, yet one or another of the limitations I have just enumerated will keep hobbing into the discussion.

The trail that I would attempt to illumine for you is the trail of man's effort to gain knowledge of the physical world. It has been and it remains a long tortuous path, beset with all kinds of pitfalls and obstacles, which become all the more tricky because so many of the travellers along this road have traversed it so blithely, so unaware of its difficulties, under the illusion that it was a broad straight highway that they trod.

You would think that one of the easiest things in the world would be for a human being to go out and observe a simple unadulterated fact in all its pristine innocence and individuality. Well, if you would, you have simply never tried to teach freshmen a laboratory science.

So conditioned are we by our social background, so influenced are we by feelings, emotions, and human relationships, that the most unlikely thing in the world is for us to go out and observe a simple unadulterated fact. So is it today. So was it, even more so, in the beginning of man's attempt at precise thinking. Then there were no examples of exact thinking set before us, like a system of geometry or a motor car, and what man had to go on was his social and religious background with its emphasis on feeling and desire rather than on knowledge.

Under these conditions science began. Exactly what it was that preconditioned it historians do not seem to agree upon. Some suggest that it was the weak political and religious organization in ancient

Greece—lack of vested interests, you see—that made science possible, but this is only a guess. At any rate, the first appearance of science was in Greece in the sixth century before our era. So great has been the destruction of records that there is considerable difficulty in reconstructing an adequate picture of the scientific work of this century. No one of the scientific books of the period is preserved in any more than the merest fragments. We can, however, detect two movements.

There were, first of all, the physicists, beginning with Thales of Miletos. It was he who is said to have predicted an eclipse of the sun that astronomers have dated in 585 B. C., thus giving us one of our first fixed dates in the history of science. And he and his successors in Asia Minor, in Sicily, in southern Italy, and, to a small extent, in Greece proper, figure very prominently in the early pages of most histories of philosophy and science.

Now these men, by one of the most amazing and unwarranted assumptions in the history of human thought, without going to the trouble to discover what were the facts in the case, proposed to answer at one stroke the central problem of metaphysics: what is the nature of reality. Water, fire, the flux, atoms, were the equally meaningless answers which two centuries of arm chair philosophers gave to this nearly insoluble problem. Yet in practically all our histories of science and philosophy these men are heralded as the originators of exact thought. And their methods have, unfortunately, been too frequently practiced by their successors. Their works are lost, which is, perhaps, no more than they deserved. The citadel of science was not to be taken by a *tour de force*.

The seeds of a more significant approach to the problems of the world were being planted in the same sixth century by another group of men who have received the name *logographers*, literally writers of words or discourses. These men engaged in an activity that some of you may be inclined to deny was scientific at all, namely the organization of the stories and legends that they found current in the communities where they lived. A moment's reflection, however, should show you that if we were going to start in the business of organizing knowledge, which is the business of science, that this is a very logical place to begin. Yet I venture to assert that there are ten of you who have heard of Thales to one who knows of Hekataeus and the logographers, yet, I believe, that the achievements of the latter were the more pregnant of the two. The logographers were collectors of facts,—a slow and, to the outsider, an uninteresting and laborious task, yet it is the beginning of true science.

The logographers led the way for Herodotus and Thucydides in the next century to lay the foundation for scientific history. Herodotus told the story of the Persian War; his history was anecdotal, but it was a beginning. And Thucydides in the next generation achieved such heights of objectivity and precision in portions of his narrative of the Peloponnesian War that those who know tell us they have not been surpassed by any subsequent historian.

The earliest biological works to be preserved, the medical treatises of Hippocrates of Cos, date from the time of Herodotus and Thucydides, as well as does one of the earliest works on geometry, by Hippocrates of Chios. This latter work, however, is lost; in fact no complete mathematical work is preserved anterior to that of Euclid, about 300 B. C., which was, however, only the terminal product of over a hundred years of geometrical activity.

The biological and mathematical accomplishments of the fifth century were, however, largely an anticipation of things to come. The main work of the period was humanistic—and the discovery of scientific history its main achievement. Man must master himself and his capacities before he can go out and master the external world—and the sophists—"wise men"—of the end of the fifth century represent this tendency. Rhetoric, grammar, the structure of words and language, synonyms, logic, ethics, politics, the obligations of the individual to his city—these were the weighty matters that almost for the first time came under consideration. The sophists, even the greatest of them, Socrates, left no writings—the concepts they were dealing with were too vague to bear the burden of such formality. And it was left to Plato, the follower of Socrates, in the next century, to formulate the first great philosophical system on their basis. It was not a scientific system that Plato formulated, though geometry and astronomy made progress. The world of facts was still largely below the horizon, except, for instance, as members of the Academy are said to have classified plants as an exercise in logic! The tools, however, were being tempered that the Peripatetics could use in their attack on nature in the next generation—not perfect tools, by any means, but still serviceable enough, though it is to some of their imperfections that I shall shortly direct your attention.

Aristotle, the much maligned, the much misunderstood, was the true founder of empirical science. The physicists, with their reduction of reality to "atoms and the void" and their final rejection of experience, served as warning posts of certain pit-falls into which Aristotle must not slip. And the historians and physicians—his own father was a

physician—had pointed the way. His fundamental point of view, however, he gained from his master, Plato: the world is essentially a teleological system, from “teleos” end, its end, aim, and final explanation is to be found in God. Aristotle did not, however, limit this explanation to the largely ethical field in which Plato operated, but extended it to the qualitative richness of the phenomenal world, the world of empirical science, which he was the first to organize and explore in any general fashion. Biology was Aristotle’s major contribution to natural science, but psychology, logic, ethics, political science, and literary criticism are other subjects which he established.

Thus Aristotle came to carve the groove in which Greek science was to follow. His successors might disagree with him in this or that metaphysical detail—his metaphysical system or theory of reality was only one among many—but Aristotelian science reigned supreme. The world was a teleological system, finding its final explanation in God, and all that the scientist had to do was to look out and these final causes would immediately appear clear to him.

So well did Aristotle labor that in most of the fields to which he contributed his writings constituted not only the first but the last word of Greek science on the subject, and most of the outstanding contributions after his time were in fields in which he did not specialize. Theophrastus (d. 285 B. C.) produced a work on plants that came to supplant Aristotle’s. But Euclid (300 B. C.) in geometry, Archimedes (killed by the Romans in the sack of Syracuse, 212 B. C.) in physics and mathematics, Ptolemy (125 A. D.) in astronomy and geography and Galen (200 A. D.) in medicine, added to and supplemented rather than displaced Aristotle’s work.

Thus the Greeks came to complete their survey of the physical world. To us, of course, it is a hesitant and rather scanty beginning, but to the Greeks, I believe, it represented a relatively complete, mature survey of nature in terms of the methods at their disposal and in terms of their point of view.

There was one field, however, which by its very nature, no one man, no matter how able, could ever exhaust. This was the field of human history, both political and literary. No matter how masterfully a Thucydides might describe events up to his time, there were always new events occurring to be described—more events, it may be ironically indicated, than there were able historians to handle them. So that we find the members of Aristotle’s Lyceum and of the famous Museum that the early Ptolemies established in Alexandria giving themselves

over in great measure to literary and historical studies, most of which are lost. One of the intriguing names that has come down to us from this time is that of Eratosthenes. Chief of the Alexandrian library for many years in the latter part of the third century, the story goes that he came to bear the nickname Beta, because, it was said, while he stood first in no one thing, he stood second in nearly everything: astronomer, mathematician, geographer, historian, literary critic, grammarian—these were some of the fields in which he was reputed—yet not one book of his has survived. It was not worth while to keep second bests.

And so Greek science passed out. Ptolemy (125) and Galen (200) are just about its last important figures. Why? The historians are as little agreed on that as on the causes of its rise in the first place. Edward Gibbon placed the incubus for the destruction of classical civilization on the rise of Christianity and barbarism, but Greek science was a thoroughly dead corpse long before either of these factors had made much of an appearance. Or we can place the blame on the ethical-mystical-eschatological movement in the Mediterranean World of which Christianity was only a special case. When man is more absorbed with matters of conduct than of factor, when the affairs of the next world come to supersede in importance the affairs of this world, then science can never thrive.

I am, however, more inclined to the suspicion that Greek science held within itself, even in its lustiest days, the germs of its decay. It was, at best, a half-hearted assault on nature, in which the observer was too anxious to pop back into his own shell of rationalization. The world was, after all, a rational, smooth running affair terminating in God. All that was necessary was a brief examination of a small portion of it—just enough to get the drift, like a freshman looking through a microscope—and the rest could be figured out deductively. The Greeks, from their point of view, completed or nearly completed their survey of nature. When our methods and our point of view become as thoroughly exhausted as were those of the Greeks, then we shall enter another middle ages likewise.

The Greeks were also mightily handicapped by the lack of technical aides: printing, microscope, and telescope, which were such a boon to science in the age of its rebirth. The importance of printing is difficult to over emphasize. In its absence, books remained so few and expensive that learning was restricted to a few centers and to relatively few persons. The importance of this will be appreciated when we remember that dozens or hundreds of persons read a book to one who is inspired

by it to go out and do likewise. Even in our own days those best able to use books are not always those best able to purchase them.

Greek science was conditioned, then, primarily by its teleological view of the world. This resulted, paradoxically, both in too little and too much—too little observation of the actual facts of nature, too much interpretation of the few facts that were observed, too much uncritical cocksureness that the ultimate purposes of the Deity may be discovered by anyone who will take the trouble to look.

Despite its limitations, Greek science was, up to the time of Galileo, the mightiest and most potent intellectual eddy that had ever troubled the stagnant current of the human mind. In the middle ages it fused with the ethico-religious movements of the two great faiths of Islam and Christianity to produce the famous systems of the Arabian philosophers, Avicenna and Averroes, on the one hand, and the more famous system of the Catholic schoolman, Thomas Aquinas, on the other. And then, without loss of vigor, it continued on to function at the birth of modern science. For it was no formal gesture or doffing of the hat to the honor and dignity of the ancients that the Renaissance scientists made to their Greek predecessors. Copernicus, for instance, made direct use of Ptolemy's tables of observations in calculating the new planetary orbits that he proposed. The new natural history sprung directly from a study of Aristotle's *History of Animals*. The deductive aspect of logic was all Aristotle's; geometry went on from Euclid. And much of the humanistic work, which no less than the work in natural science was a characteristic of the new period, took its inspiration from the *Ethics*, *Politics*, and especially the *Poetics* of the Stagerite.

Renaissance science was, moreover, in its inception essentially Greek in method and attitude. Its first triumphs were the astronomical system of Copernicus and the anatomical system of Vesalius, which, from their simultaneous publication in the year 1543, mark that date as the beginning of the new epoch.

The same spirit that induced the Italian scholars of this period to renew their acquaintance with and emulate the classical literary models, eventually led them to a similar emulation of the classical scientific works—not only to write commentaries on them, that had been going on for many centuries—but to imitate them in a direct study of nature itself. The movement in biology is most appropriately known as neo-Aristotelianism, and consisted largely in the production of massive encyclopaedias of natural history, which terminated in the course of a couple of centuries in the prolix natural history of Buffon, on the one

hand, and in the concise system of classification of Linnaeus, on the other. Still the old Aristotelian classification, but with this difference—men were no longer satisfied, in the long run, with a hasty glance at nature followed by an intensive speculation. They continued to speculate—that is, perhaps, still the dominant interest in science for many persons, the erection of intellect-satisfying theories—but each speculator tended to want to have a look for himself. One man's observations would check another's, just as one man's speculations would check another's—but the observations tended to confirm and supplement one another, whereas the speculations tended largely to neutralize each other. In this way the complexity and perfection of the observational sciences has grown up.

Before, however, the new science was half a century old, it had enlisted in its service the genius of the Italian, Galileo. More than any other one man, he influenced its essential spirit and philosophy, so that modern science might be called Galilean in contrast to the old or Aristotelian. Galileo's effective introduction of the experimental method was the thing.

Now the experimental method can be conveniently pigeon-holed as simply one among a series of methods for making observations, which is the fundamental method of all science. But, historically, at any rate, in Galileo's hands, experimentation gave an insight into nature that simple observation could never have done. One scientist can come along and arrange a series of beetles or ferns or trilobites in one sort of a system; another scientist comes along and arranges them in an entirely different system; and another does it in a third way, and another in a fourth, and so on, until one begins to be sadly weary of the whole process and to suspect its futility. That is Aristotelian science, though perhaps in a lesser aspect.

Galileo, on the other hand, discovered a way to circumvent the non-conclusiveness of this approach to nature. By means of the experiment he came to the concept of natural law, for example, the mathematical relationships between time and distance involved in the movement of bodies freely falling towards the earth. Of course, after Galileo had done it, everyone, by simple observation, could see that apples and stones and other objects had been behaving in this fashion all the time, but it took the artificially over simplified conditions that always constitute a scientific experiment to bring these relationships to light in the first instance.

And the discovery of natural laws showed that there was something wrong with the Aristotelian scheme of things. Or perhaps I can express it more adequately by saying that it gave men something more profitable

to investigate and think about than endless series of logical relationships. Here was something definite, concrete, objective, that men could agree and get together upon. And the thought gradually occurred to Galileo and his successors down to the present that the rest was a superstructure that could well be dispensed with, especially those parts dealing with the ultimate intentions of the Deity in making the world.

On the other hand, Renaissance scientists were totally unprepared to reject God entirely as a superfluous hypothesis, so that He was put off in the rather hazy distance as a sort of super-mathematician, the starter of it all, and ultimately, of course, responsible for everything that happened, but no longer immediately responsible for the detailed operation of the world. At any rate, thoughts of God and His purposes no longer continued to haunt the experimenters, at least while they were in their workshops.

The advent of Galileo—he died in 1641—did not mean, of course, that all science immediately became experimental or even non-teleological in character. In other fields experimentation lagged. Experimentation can, in fact, be applied only where the experimenter has been fortunate or clever enough to create an artificially simplified situation as the field for his experiment—hence the more complicated phenomena respond more slowly or not at all to this method.

In biology, accordingly, experimentation was not introduced for three centuries—with the single brilliant exception of the demonstration, within Galileo's own life-time, of the circulation of the blood. This was accomplished by the English physician, William Harvey. Here was a relatively simple, highly mechanical aspect of the body's function that lay open to ready discovery, without elaborate apparatus or technique, once an adequate method of approaching nature was evolved.

Biology as a whole remained observational, nay, not only observational but teleological as well—still under the magic spell of the sage of Stagira. For Aristotle was, first of all, a biologist—a momentous circumstance in the history of human thought. Plato, Aristotle's master, I have already told you, had arrived at a teleological view of the world through an examination of man's inner aspirations and strivings. And Aristotle, as chance would have it, began his studies with biology, just that aspect of nature that is most susceptible to a teleological explanation—thus seeming to reenforce for the external world what had already become apparent for the internal. If Aristotle had only conjured with falling bodies rather than with sea shells and devil fish, the history of thought might have been different.

For everywhere that the biologist turns he sees evidence of design, of adaptation. The living organism is a system in unstable equilibrium with its surroundings, and to exist at all in this condition of instability, it must be adapted to a given environment. And the age-long evolution of life on the earth has produced some remarkable results. All living nature, to a first approximation, is adapted, or appears to be adapted—Aristotle was eternally right, but it was a partial truth that he grasped, and he erred in its general extension to inanimate nature.

This undeniable fact of adaptation has been, then, the onerous incubus that biologists have had to bear in their struggle to greater adequacy. Slowly, too slowly, they have freed themselves from the taint of teleology, especially in those fields like morphology and classification where the restraining hand of the experimental method has not been felt. Only a hundred years ago a leading text-book on entomology carried long passages in which the authors professed to set forth in detail the purposes of the Creator in creating the world of plants and animals, including the view that they were created in part for the specific spiritual instruction of man!

This Aristotelian interpretation of the living world really began to break first when chemists in the days of Lavoisier, through the isolation of oxygen and carbon dioxide, began an attack on vital processes. In the field of morphology and classification, it did not come till the speculations of Darwin showed how these adaptations might have arisen without the intervention of a directing agency, but through the operation of natural selection. And even the Darwinians had an almost sublime faith in their ability to detect cause and effect in the operation of natural selection. They knew, for instance, without the shadow of a doubt, that a cat's claws had been developed to catch mice with; just as Aristotle had known that a shark's mouth was located on the under side of its head so that it would have to turn over in order to feed and thus allow a certain percentage of its prey to escape and thus be kept from over eating! They were not content with the simple statement of fact that a cat does catch mice with its claws, a statement that modern biologists are coming to see is about all that is really given.

But if biology was and is backward and over-teleological in its outlook, psychology and history were even more so. Not even yet can history be said to have made much more than a beginning in freeing itself from superfluous concepts. We yet play with ideas of progress and the advance of democracy—or is it fascism that is today on the march?

On the other hand, while biology, with its more complex subject-matter, lagged, physics continued to advance. It had occurred to Galileo

that those properties of bodies like color, sound, odor, etc., could be regarded as secondary and subjective, that is, as belonging not to the objects themselves, but to the observer. It was upwards of two-hundred years or more, however, before the physical equivalents of some of these began to be cleared up in any satisfactory manner. I refer, of course, to the ether-wave theory of light and to the air-wave theory of sound. The only features that seemed to Galileo likely to convey any real information concerning the external world were those properties revealed by motion, the primary qualities of mass, extension, etc. And in the course of the next two centuries these, too, were dissolved away by the continued advance of philosophical, especially epistemological, analysis, until by the time of Kant the "thing-in-itself" had become a hazy entity with the less said about it the better. Science was restricted to phenomena—Hume had shown that even causality was a gratuitous assumption, that all that was given was a sequence of phenomena—and under this aegis the tremendous progress of the nineteenth and twentieth centuries has been made. The external world has become a shadowy inference, whose properties, so far as they can be determined at all, can be determined not with certainty but only with probability, though frequently with a very high degree of probability.

Recall, not all science reached this level, especially descriptive biology, but it has been the aim which all scientists have set before themselves in prosecuting their studies, the ideal of scientific objectivity—not in the sense that they hope to pierce the barrier of their sense data to the external world, but that they try to handle these sense data in impersonal unemotional fashion without reference to their preconceived ideas, their fears, or their desires. It has been easiest to do this in subjects susceptible to experimentation, as in physics, chemistry, and experimental biology and medicine. It has likewise been possible to bring it about in fields where very precise observations can be made, as in astronomy and certain aspects of crystallography. But in descriptive biology and in historical and humanistic sciences, in fact, wherever science is forced to remain descriptive because of the complexity or apparent complexity of the subject matter, there the incubus of the fundamental inadequacy of the Aristotelian approach to nature remains.

When experimentalists philosophize they have a strong tendency to claim the whole hog, to proclaim experimentation as the only true scientific method, to exclude all else as sophistry and words—all this for reasons that have been hinted upon in the foregoing. I shall not linger over the matter. Science may be limited, but it certainly is not limited as much as

that! Such a limitation would exclude mathematics, astronomy, geology, descriptive biology, and history from the number of the sciences. It would mean that science did not come into existence at all till the close of the sixteenth century. It would represent an utterly unjustifiable attempt to take an old word in a new meaning. Observation and classification is the fundamental scientific method, and experimentation is simply one way among several of making observations—a very potent way, it is true, but not the only way. In fact, the very act of comparing and contrasting and thus evaluating experiments is itself an act of non-experimental classification into which some of the same fallacies may enter that may be involved in any other classification.

No! The problem is not one of simply separating the sheep from the goats and then neglecting the goats. It is the difficult one of reinvestigating descriptive science, the nature and validity of its logical pre-suppositions, in an attempt to free it from its gratuitous assumptions and to determine what may legitimately be concluded from its data. It is not a task I am prepared to perform, though its most effective doing would be by one personally and intimately cognizant of the pitfalls in the path of descriptive science.

An effort in this direction has been made by the geologists in their method of multiple hypotheses. As many different hypotheses as occur to the investigator as accounting for the facts are set down and only those eliminated that are for some definite reason untenable. The author may thus come out with a series of explanations. No effort is made to select among mere probabilities, though a listing in order of possibly decreasing probability might be desirable.

We must inevitably and continuously regard every classification, every system, as purely provisional, not excluding from our purview previous attempts in the same field, nor eliminating from our examination subsequent efforts of others, even though our own most cherished castles are brought tumbling into ruins. In reality, we should have no "cherished castles"—although to decide that one should cease to be human in order to become a scientist is impossible.

Perhaps we should go back to the studies reputed to have been carried on in the Academy of Plato, where plants were said to have been classified as a problem in pure logic. Some philosophically minded zoologist or botanist should take some well known but not too large group of supposedly distinct species and see in just how many different ways he could arrange and classify them, by employing different sets of assumptions see how many different phylogenetic trees he could construct

to illustrate the same set of facts. The treatise would probably go unnoticed or scoffed at by most conventional biologists, but some few might see the light of day and be led into a new view of the logical pre-suppositions of their work. At any rate, there is a problem for someone who would combine biology and philosophy.

Now I am a very real believer in the evolution of the plant and animal kingdoms and in *natural* as opposed to *artificial* systems of classification. But it is *a* rather than *the* natural system of classification that we have to deal with in any single instance, and all systems of classification and all phylogenetic schemes are to be held provisionally and lightly. One can go a step farther and generalize: all hypotheses and all theories are to be provisionally held—held as long as they aid us in the understanding of data, modified and abandoned when they cease to so help us.

Many of us, I know, are attracted to science in important measure by its theoretical superstructure, just as we are intrigued into the theater by the bright lights and famous names without. Once within, however, it is the detail of the plot and characterization that holds us, just as once within the citadel of science, it is the detail, the data of science, the effective applications, which are our concern. The theories are mnemonic devices to help us in the handling of our facts. When they no longer serve they must be discarded.

What, then of the age-old questions that a complete science used to set itself to solve? What of the beginning of the world? Its significance? Its end? To these questions modern science has no answer. It is not simply a question of bigger telescopes or microscopes, of more ingenious theories or methods of analysis. No matter how far backwards or forwards we extrapolate our cosmological theory, we can never get to a real beginning or a real end. It would be like an individual trying to determine his own origin or fate by looking into his own consciousness, where he can find no recollection of the one and can not conceive the other. Such matters are without the logic of science to analyze, though its proponents have not and do not always understand that such is the case. That is the central theme of my discussion: the logical limitation of science to what is given without gratuitous assumptions. It does not deny us theory and speculation, but they must be held provisionally and they must remain in character with general scientific logic.

Thus develops the great paradox in science history.

The Greeks knew little about nature, by modern standards practically nothing, yet for them it was an open book that he who ran might read. It was a fairly simple world of concrete objects, of color, sound, and

beauty, striving through plants and animals to man and God-head. And one had only to lift his eyes on a clear night to witness the slowly revolving sphere of the fixed stars, which was God's own manifestation of His perfection and beyond which, beyond space and time, at not too great a distance, He reigned in all His perfection.

And then came the Renaissance. One by one, color, sound, matter, beauty, God-head were taken out of the world and put into man's own mind. The crystal firmament of the stars was shattered as a figment of the imagination. Yet even as Galileo was pointing out the illusory nature of the ancient construction, he was introducing both microscope and telescope to scientific ends, through which man was to see things of which the ancients never dreamed.

The same century that saw philosophers concluding that all science can know is phenomena saw the establishment of chemistry and the invention of the steam engine. We do not know whether light is a wave or a series of particles, but we have photography and moving pictures. We do not know what electricity is, but we have the electric motor and the radio. We do not know what energy is, but we have the automobile and the airplane. We do not know what life and its purposes are, but we have aseptic surgery and have gone a long way in our conquest of bacterial disease.

As our knowledge of nature has become less certain, that is, as our appreciation of the logical limitations of science has increased, our control over nature has become more effective.

It is a strange alien world in which the philosopher-scientist of the present time finds himself, a world completely devoid of beauty, composed of blind unthinking brutal forces, yet so fully are we bringing it to subserve our purposes that I am sure that, strangers that we are in it, few of us would exchange it for the more open cheerful world of the Greeks.

Somehow, moreover, even for the scientist, human values do intrude. If I were a philosopher rather than a scientist, I should probably be more concerned than I am with the manner of their entree. The world for every scientist is beautiful and intriguing—that is why we study it—but our scientific logic shows us that this beauty and intrigue are our contribution. Just how the two are to be connected up, how the world of science and the world of human values, of beauty, of goodness, are to be brought together is probably the outstanding philosophical problem of the present time. Whatever the solution, it must meet as a first hurdle the critique of modern scientific logic, some of whose aspects I have been attempting to develop.

Why Not Parasitism?

By HELEN J. WERBY

TO the average zoologist, as to the casual observer, parasites are looked down upon as degenerate individuals, unworthy of respect, understanding, or any of the kindly feelings of good fellowship one usually extends to other biological creatures—co-inhabitants of a harsh world, wherein all are striving for the same goal, i. e. a comfortable abode, sufficient of nourishing food (and maybe even some extra), agreeable companionship, means and a suitable place to rear a family, in short, a well rounded, full life. Other animals get zoological sympathy for their lives and their life activities, even if at times the sympathy may become tinged with irresistible curiosity as to intimacies of structure—usually ending tragically for the victim of such curiosity and his survivors.

But parasites! The very word is anathema to an admittedly self-respecting and righteous zoologist. Yet, just as in human society at large, most are born to slave, or to sneer at and self-righteously criticise the more fortunate few who live without visible means of support, so in the rest of the animal world we also have the two classes. First there are the workers, who toil industriously and smugly, living their brief futile little lives, with no hope of an ultimate period of restful retirement, since when their usefulness is over, so are their lives. No wonder if their souls are warped and their minds bereft of intelligence—creatures of reflex actions!

The second group—the politicians of the animal kingdom, lead no such hard lives, but live by their wits and their wily actions. Why should they struggle for a mere existence, for food and lodging, when these are to be had for the taking, if technique is used? So in the interests of the much maligned and misunderstood parasites, I here present a few of the problems facing a potential parasite, and how these have been met and solved.

Most parasitic forms are relegated to animal groups which also contain free-living forms, and thus are not so pointedly shoved aside or ignored, only referred to slightlyingly as “trematodes, cestodes,” etc., “just our country cousins, my dear” effect. But the poor Acanthocephala, those cacti of the animal world, even the Nematodes (and everyone knows the reputation of nematodes!) won’t have anything to do with them any more, but have cut them off without a heritage, much

worse, even without a phylum name! And why have the Acanthocephala been so exiled? Simply because they have no digestive tracts at any stage of their life cycles. Now tapeworms have no digestive tract as adults, but they have not lost caste entirely, because they may have traces of the system in some of the larval stages.

Parasitologists have been quick to follow the example set by their favorites in ostracising the Acanthocephala, thus we find the group an object of scorn, neglected and despised by parasites and parasitologists alike. No one criticises man for not having a tail any more, in fact man prides himself on the loss and calls it "evolution." But when a parasite gets rid of a completely non-essential digestive tract, he is severely censured. Now at best a digestive tract is only a temporary pleasure, at worst a source of pain and suffering, to most of us a tax on purse and ingenuity (depending somewhat on the sex of the possessor). Why not come out openly and sing paeans of praise to an animal that has clearly dispensed with it, and successfully, too?

Of course the Acanthocephala were not always parasites, that phase came only secondarily, after the members of the group had first conceived the idea of living well, but easily. The hypothetical ancestor of these modern parasitic forms is the so-called "stem-form"*, free living, but whose descendants carried on in the parasitic steps of their pioneering forefathers, but raised the trait to the fine art of complete dependence on an unsuspecting host.

* Let us first examine several characteristics of this ancestral progenitor. To get this form, we trace backwards from those species occupying the end points of the relationship along diverging lines, back to the fundamental forms, that is, those families which are regarded as root-like or primitive. Each of the two orders of the Acanthocephala has its basic family; points of common in these two basic families, wherein overlapping may occur, are considered to be fundamental and basic, or original points of structure. Without discussing the evidence in detail, we may assume an ancestral stem-form with the following characteristics:

1—A spined body, on account of the general tendency to reduction of spines in the more divergent genera.

2—Medium broad body, the typically primitive form.

3—A bilaterally symmetrical urogenital system, since it arises thus in the larva; the protonephridial organs must be assumed as

*The scientific facts used in this paper were abstracted from Dr. A. Meyer's Monograph of the Acanthocephala.

present primitively, since there is no biological evidence of the origin of new parts within the class Acanthocephala.

4—An endodermal germ layer corresponding to the intestine is present (the embryonic ligament plasma-column or ligament sac) and can be assumed in the ancestral form as being of a tubular form with a wall consisting of layers. The mouth is considered to be at the anterior, ventral cleft of the inner proboscis receptacle wall, the cleft being persistent in the genus *Macracanthorhynchus* (the parasite of the domestic pig), altho slightly displaced. The esophagus passes through the receptacle and has its posterior opening at the posterior end of the receptacle, somewhat dorsally. The anus cannot be definitely localized, but its position can perhaps be assumed through the reproductive organs as lying somewhat internal from the extreme posterior end of the animal.

5—The stem-form was probably richer in cells (the modern forms are considered as consisting of a non-cellular syncytium, with the exception of several organs) according to the evidence of the protonephridial organs, thus also richer in nuclei, or at least as rich, as any of the present species. The number of nuclei of later species was secondarily reduced, i. e. failed to develop, due to the anaerobic conditions of endoparasitism. The body size of the larger forms is said to be due to secondary enlargement, conditioned through (1) body plasma relaxation or loosening, and (2) the temperature of the warm-blooded hosts.

6—The mode of life of the ancestral type must be assumed as bound to the ground, as a solid substratum, with slightly decayed food, and slow movement. This assumption is based on the weak development of the body and proboscis receptacle musculature.

* Let us now consider the origin of the endoparasitic acanthocephala from the free-living ancestral form. Having once decided on changing over to a politician's life of comparative ease, did the aboriginal type boldly come out and run on a platform of avowed parasitism? Not this wily individual—he passively came in on a landslide, as it were. That is to say, the impulse to become parasitic came not from the ancestral potential parasite, but from the surrounding macro-cosmic happenings: small animals of the earth are eaten by larger animals living on the ground, whereby certain uneatables are taken into the intestine. The passive behavior of ancestral forms can indeed be assumed in endoparasites as more likely than an active occurrence, since actively sought entrance to the digestive tract would mean a voluntary exposure to, or preference for, the acid medium of the

stomach, and no acanthocephalan has as yet been found there. A purely accidental entrance is not indicated, since the ancestral forms were not microscopic in size—their consumers did not have to eat them, they did so voluntarily. Since these stem-forms withstood the action of the stomach, they must have been indigestible. Therefore, whether they were erroneously eaten as digestible, or accidentally along with something else, their entrance was achieved without any exertion to themselves.

* Accommodation or adaptation to the new Utopia attained consisted largely in perfecting means of insurance against forcible ejection, such as elaboration of the proboscis hooks, and strengthening of the muscles which control the proboscis. With no further need for the digestive tract, its removal would seem to be expedient, facilitating a flattening against the host's intestinal wall, making the presence of the parasite less obvious. So the tract was allowed to modify its activity, becoming functional as the genital ligament, the supportive structure for the all-important reproductive system.

Having arrived in this paradise of food, the question came (as to all of us who have the chance to hold a complete menu in hand), "What shall I eat?" The Acanthocephala exercise the power of selection of food, which leaves its mark in the color of the parasite. They themselves are colorless, what color they possess is chiefly confined to the skin and the lemnisci. This color depends on the food drops (oils and fats) which are absorbed, either their color in the condition of absorption, or the color of the digestion products of these fats and oils. The colors shown are red, orange, yellow, and a brownish hue. That the color is not the animal's own, is shown by the fact that it disappears after the taking of the parasite from the intestine and keeping it in physiological salt solution, whereby the colored nourishment, fluctuating in the skin-vascular system, quickly disappears, as it is used up.

Colored species have selected oils, the colorless ones, fats. When, of different species occurring in the intestine of the same host, and in similar regions, the one is colored, the other uncolored, it is indicative, that the coloring depends, not on the type of food eaten by the host, but on the specific choice of the different parasitic species; the colored species has preferably absorbed the colored oily ingredients, while the colorless one apparently has preferred the colorless fats. As an example, one species of the genus *Bolbosoma* is orange to brick-red in one species of whales which eat crustacea, white in another species, which eat fish. On the other hand another species of *Bolbosoma* is

colored red in the small intestine of its whale host, but is white in the large intestine; in this case, however, the color difference rests on deficiency or lack, in the large intestine, of the oils normally preferred.

Other special variations are found occasionally in the same individuals, they are apparently conditioned through the temporary combination of the host's nourishment.

In any case, the *Acanthocephala* exert choice in the matter of food eaten, and thus also in the hue of their own complexions. If our food affected us in the same way, most of us would probably give up lemon pie and take to tomato juice or spinach, or we might vary with our seasonal or daily moods, or celebrate holidays in skin colors. The implications are legion.

Furthermore, as well as having the choice of food available, the *Acanthocephala* also have their choice of restaurant patronized. There is said to be a law of host specificity for the group, any one species being restricted in its choice of hosts, and in turn, any one host species being parasitized almost exclusively by either one species of parasite, or at least only by rather closely related forms. Just as a restaurant run by Italians, let us say, would not be likely to prove attractive to Scandinavians.

* But to return to the problems of our parasites, comfortably enconced for the rest of their lives under the most ideally optimum conditions. With reference to the origin of the complex life cycle, it is considered evident that the insertion of an intermediate host is a secondary occurrence. Here again, however, we may discern the obvious working of a consciously developed plan. We seek the parallel in human society. The old folks are now well established in a warm, comfortable abode—perhaps a little dark (but what is darkness to the blind?), within easy reach of enough food to last until their inevitable demise (or that of the host). But what of the younger generation? Social justice demands that the parents give their offspring every chance for happy, satisfyingly well-provided lives. If the parents are selfish, perhaps they might prefer to keep their children at home close to themselves (or at least within the limits of the length of the host's intestine). However Mother Nature has imposed on living organisms one supreme duty, that of keeping their species on earth. And the *Acanthocephala*, in return for her generous bounty, are nothing if not prolific in their gratitude. Obviously it would be impossible for one pair of parents to keep at home their some 82,000 offspring, especially since the parents themselves may not be homesteading the (alimentary) tract, but be apartment house dwellers, as it were.

And so it is the duty of the parents to prepare their offspring for the future, to send them out into life, not to shift for themselves in a world of competition, but to enter on their mature lives as efficiently trained as possible. Humans send their children to colleges or training schools, or to serve as apprentices, to prepare them for the business of living. Parasites, no less foresighted, send their offspring to intermediate hosts.

Perhaps we should make the analogy more accurate. Knowing that she cannot possibly rear so many youngsters, and educate them properly, herself, the mother wraps up each small acanthocephalan in three snugly fitting shell membranes and leaves the foundlings to Mother Earth, on the door-step, or at least in the path-of-foraging, of proper foster-parents. Within such intermediate hosts, either insects or crustacea, depending on the habitat and food habits of the definitive hosts, the young parasites are freed from their wrappings, and tenderly raised to young immature adulthood. They are allowed to wander through the tissues of their new parents, who generously treat them as their own. Nay, even better than their own. For these arthropod parents leave their own offspring to shift for themselves, while they give their all to their unconsciously acquired dependents.

Within this retreat the young *Acanthocephala* learn the fundamentals of successful parasitism, to remain quiescent, eating only enough for their immediate needs of growth, and causing no distress or inconvenience to their host. Dutiful and conscientious little apprentices, taking their period of training seriously, yet humbly.

Their period of probation over, their growth and development about complete, they do not make the mistake of imitating their human relatives in going out and demanding to be placed in positions of gainful occupation. But with a deceptive coyness, they wait to make their unobtrusive entrance into larger fields. Here again the foster parents must be martyrs to the future advantage of their charges, this time, however, fatally, to the voracious appetites of those vertebrates which serve as definitive hosts for the *Acanthocephala*. Thus is fulfilled the destiny planned by the parent worms for their progeny.

From the above discussion it may be concluded, that not only did the *Acanthocephala* choose a life of parasitism as highly preferable and easier than the free-living method, but once having made the choice, the animals have gone straight towards their goal with the maximum of efficiency and intelligence, working out the finest points of detail with the greatest precision and most skillful handling.

LEUKEMIA

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LEUKEMIA is a progressive, always fatal disease of man and animals. The disease is characterized by hyperplasia of hematopoietic tissue which results in the presence of many immature and often degenerative white blood cells in the blood stream. The type of leukemia is dependent upon the predominating cell. Although first discovered in man in 1845 its cause has remained unknown.

The classical experiments of Ellermann in 1908 showed the leukemia in the fowl could be transmitted to healthy birds by the injection of tissue emulsions and filtrates of affected organs of leukemic birds. In recent years the study of leukemia has centered around this so-called transmission agent which some investigators have regarded as a filtrable virus. Leukemia is "transmissible" also in the mouse. The disease in other animals is not "transmissible" in this manner. Inter species transmission is not possible.

The investigations of the author which have extended over a period of eight years show that leukemia in the chicken, dog, monkey, hog, goat, and sheep can be induced by bacteria of the paratyphoid and typhoid groups.

In the chicken, infection is dependent upon and varies with five factors the interrelationship of which makes it possible for a single species of paratyphoid organism to induce 10 distinct pathologic manifestations and typhoid species to induce two manifestations which collectively have become known as the "leucosis complex." In other experimental animals paratyphoid species induce the leukemic leukemias. Typhoid species induce the aleukemic manifestations.

Infection must take place from the intestinal tract over a period of time but of insufficient intensity to induce septicemia. During the period of infection, phagocytes destroy the invading causal organism. Endotoxin of the organism not only tends to inhibit agglutination and phagocytosis, but also is destructive to blood cells. Accumulations of endotoxin within the phagocyte as a result of the liberation of endotoxin from the phagocytized bacterial cell, destroys the phagocyte. The continued destruction of phagocytes during the period of infection, results in the intoxication of the blood stream by the products of degeneration of the host's own tissues. In case the impetus given by

the organism is of sufficient intensity a chronic but progressive, self-perpetuating autolysis of blood cells is initiated which eventually leads to the development of leukemia. Of extreme importance is the chronicity but progressiveness of the process. Experimental animals need show no symptoms until leukemia is well established. After the development of symptoms of leukemia, the process of autolysis proceeds as before, death eventually resulting from complete intoxication of the body by the products of degeneration of the host's own tissues and an exhaustion of the hematopoietic tissues. The causal organism stimulates autolysis until it becomes a self-perpetuating process then disappears from the host; thus the organism cannot be isolated at death, unless perhaps from acute cases. In case the organism fails to stimulate autolysis to this extent, recovery from infection occurs, in most instances the host never having shown symptoms of illness.

In animals other than the chicken, infection results in leucoeytosis followed by a partial return of the blood picture to normal with the appearance of one of the leukemias four to eight months later. The incubation period in chickens usually extends from two to nine months, but a leukemic state appears immediately following infection and progresses until it is differentiated into one of the leukemias.

Leukemia has been induced in the chicken, monkey and dog by repeated injection of heat-killed causal organisms which excludes the theory that the living organism is a vehicle for a filtrable virus. Repeated intravenous injections of benzene, phenol and xylol have resulted in the development of leukemia in the chicken. The disease has been induced in the chicken, monkey, dog, rabbit, goat, and mouse by the repeated injection of living, desiccated or autolyzed homologous tissues. Whether autolysis be initiated by living or killed bacteria, chemicals or homologous tissues, the chronic but progressive nature of autolysis resulting therefrom and leading to leukemia is similar in all species.

The "transmission agent" of fowl leukemia is regarded as the accumulated products of degeneration of the host's own tissues and not as a filtrable virus. The susceptibility of the chicken and mouse to leukemia permits the transmission of the disease in this manner. The interspecies transmission of leukemia is not possible, even to the chicken, since the autolysis of blood cells is more easily initiated by the products of tissue degeneration of the species own tissues than by those of another species.

A new principle—chronic, progressive, self-perpetuating tissue autolysis, has been discovered which may be concerned in the production of other specific diseases of man and animals. Leukemia and cancer are analogous in so many respects that many able investigators have regarded leukemia as a cancer of the blood. The author offers this principle of tissue autolysis as applicable to fixed tissue and as a new and logical avenue of approach to the study of cancer.



EDITORIALS

We Salute Michigan

A PROMINENT gentleman of the radio profession devotes each of his weekly programs to the industries, the beauties and the advantages of some particular local community in the land. By so doing he absolutely insures for himself and his program at least one interested group of radio listeners. When we devoted the December issue of *The Biologist* to the University of Wisconsin we did not think of Major Bowes or his business acumen. When we jotted down the title of this editorial, however, the paralyzing thought leaped unbidden to mind,—“wonder if the members of Phi Sigma will think we are plagiarizing on radio’s ideas?” At the risk of such an accusation we repeat our salutation to Wisconsin’s great sister university in the commonwealth of the Wolverine.

Antedating most of the other midwestern state universities of higher learning by many years, the University of Michigan came into being as the result of the self-sacrificing idealism of a Catholic priest and Protestant minister who long constituted its only faculty. As time went on the University grew until today its recognition is world wide,—and the scholarly products of its educational program are to be found in almost every country, in almost every profession, and in almost every field of human service. So we salute Michigan, and particularly its vigorous chapter, the oldest surviving unit in all Phi Sigma. Not all of Beta’s history has been plain sailing. More than once it has been tried in the crucible as by fire,—and each time the pure gold has come forth, a richer, stronger and more vibrant chapter. Finally, we salute Michigan’s Beta for having a corps of energetic officers, who speedily, efficiently and effectively assembled their share in this present issue of *The Biologist*. They deserve the thanks of all Phi Sigma,—they have the heartfelt thanks of *The Biologist’s* editor.

And This Summer?

AGAIN the mails are bringing the annual crop of summer school prospectuses. With the return of spring, the mind of the advanced

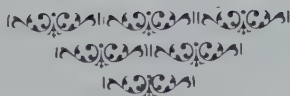
student in biology turns to his prospective summer work. Few there are, in Phi Sigma, who can afford to ease up on the strain of advanced or graduate work. The majority will probably continue their study, their research, their teaching or their field work and exploration, right on through the summer and into the fall. Just where to do this is an interesting problem. For many an investigator the summer locale will probably remain the same as his winter work. For those fortunate others who can so arrange their program, there is nothing quite so beneficial as a session or season at one or the other of our great biological summer schools. Those who have recently entered Phi Sigma may not have seen the last March-May issue of *The Biologist*. It is in their college or university library, and will repay consultation. The number of such specialized institutions, off the regular campuses of regularly established schools, is an impressive tribute to the opportunities afforded student America for the furtherance of its advanced work in the biological field.

Did You Get Yours?

NOW that initiation into Phi Sigma gives the initiate permanent membership as long as he remains on his own home chapter campus it is to be expected that the size of the active membership will increase materially. As has already been pointed out this healthy increase may be endangered on those campuses where the chapter requires too high a local fee. Assuming that such instances will be in the minority, there should also be a not inconsiderable increase in the number of *Biologists* ordered by the Secretary of each Chapter. Of course, this is going to increase the cost of publication somewhat, but the advantages which should accrue from such a procedure will ultimately overbalance any such rise in publication costs. Up to the time of the Indianapolis Convention *The Biologist* was reaching a circle of some 1600 with each issue. Supposing that this circulation could be increased to 2000, *The Biologist* would become so much the more attractive to prospective advertisers, and to the book publishers whose productions are reviewed in these pages. It is to the interest of the whole organization that Chapter Secretaries so organize their distribution methods that each active, faculty and honorary member on the campus receives a copy of each issue of our quarterly journal.

Did You See...?

THE inside of the back cover of *The Biologist*? It will be a permanent feature in all future issues. In the past more than one secretary with the best of wills in the world wrote frantic letters to the National Council in an attempt to find out just what were the duties of his office. At every convention there is a handful of secretaries present, and it is rare when more than one of them does not admit that they have passed up on some of their duties to their chapters and to the Society as a whole, not maliciously, but simply because they did not realize the extent of their functions. Then, in more than one chapter there are campus politicians who like to annex offices somewhat like Frank Buck coming back from a hunting trip with a new flock of trophies. Such people should know just what is expected of them when they campaign for secretaryships in Phi Sigma. In the hope of achieving all these purposes this new departure was adopted.



CHAPTER NEWS LETTERS

Beta

President—Joseph P. Harris, Department of Zoology.

Vice-President—Hugh Clark, Department of Zoology.

Recording Secretary—Kathleen Hussey, Department of Zoology.

Corresponding Secretary—Roy E. Joyce, Department of Botany.

Treasurer—Robert Lindberg, Department of Bacteriology.

If any one accomplishment of the National Convention were to be singled out (save the elimination of National dues!), I believe it should be stated as the creation of a proper and profound respect for the National Officers. Our delegate, Mr. Wayne Whitaker, was thoroughly impressed by the amount of time and energy devoted to the Society by these Fathers of Phi Sigma. At once, this results in a feeling of co-operation within the Society and places the burden of Phi Sigma's progress on the individual chapters *alone*; and this should be good for the health of the Society.

In his written report of the Convention, Mr. Whitaker made a number of suggestions to Beta, which presumably were inspired by the Convention. By far the most interesting of these, in light of the fact that Beta is almost exclusively a chapter of Graduates, having only those undergraduates who seem now so outstanding that they will no doubt put the graduate members to shame one day, was the following: "I feel more strongly than ever that it would be very unwise for Beta to make itself an honorary and mutual admiration society. This campus needs a student biological society that will present to the students . . . the fair picture of the worth and romance in biological research."

Perhaps stirred by this suggestion (accusation?) or perhaps independently, our present President offered to the society after our last election a proposition for the creation of a new sub-group of Beta, which would be designated Guest Members. This group would have all the privileges of the society save voting; its members would be largely undergraduates who have not yet had an opportunity to decide on a research career, and partly of beginning graduate students who, because of residence requirements or some other reason, do not quite measure up to the present standards of Beta's regular members. They would be elected at the same meeting as the regular members, but would be initiated at a separate meeting; membership in this group would run for only one year.

The idea is calculated to create by example an interest in Biological research where it may not have been before, and to nurture such an interest once it has started. If, by this method, Beta were to bring into Biological research one good student per year, her purpose would be admirably fulfilled. This program met with great favor among those present; a lengthy discussion followed the suggestion, and the data are now in the hands of a committee, headed by Leroy Harvey of the Botany Department, for the purpose of drawing up a constitution governing this new foster child of Beta.

Since our last report, the society has heard very instructive discourses on a number of subjects, e. g., "Greenland: Its History and Its People" by Dr. R. L. Belknap of the Geology Department; "Quantitative Analysis of Biological Materials by Spectroscopic Methods" by Dr. O. S. Duffendack, Professor of Physics, who addressed the group of 1938 initiates; "Experimental Pneumonia," an inspiring address by Dr. W. J. Nungester, a member of Phi Sigma who is now Associate Professor in the Department of Bacteriology. Preceding the election, our most recent meeting, the society was privileged to hear Miss Lois Jotter of the Botany Department in a report on the Yosemite Field School of Natural History, beautifully and intelligently illustrated by colored motion pictures.

The following people were initiated this fall:

Fred R. Cagle	Jack Lapides
John N. Clancy	Mary Jane Manchester
Donald P. Duncan	Dr. James A. Miller
Joseph H. Gast	Grace L. Orton
Jack W. Gebhard	Americo Pomales-Lebron
William M. Gilbert	Gertrude Rodney
Marvin D. Hoover	Mrs. Hattie Bell Ross
John P. Johnston	Carleton R. Treadwell
Arden H. Killinger	Katherine E. Yaw
Dr. Horton D. Kimball	Victor M. Zerbi

We wish to acknowledge the splendid cooperation of the following people for submitting material from their departments: George Quimby, Anthropology; Irving Cantrall, University Museums; John Broohart, Physiology, Anatomy, Biochemistry, Pathology; Victor Zerbi, Bacteriology; John Wilson, Paleontology; Lois Jotter, Botany; Donald Duncan, School of Forestry and Conservation; and Dr. Alfred H. Stockard, Biological Station; and Jack W. Gebhard, Psychology.

HUGH CLARK, *Vice-President*

Epsilon

President—Hugh Capps, 1627 Gilpin, Denver, Colorado.

Vice-President—Chas. Hansen, 1301 Ogden, Denver, Colorado.

Secretary-Treasurer—Carol Cox, 1127 Gaylord St., Denver, Colorado.

No Report

Zeta

President—H. R. Bird, 117 Ag. Chem. Bldg., Univ. Wisc., Madison, Wisc.

Vice-President—R. E. Duncan, 402 Biol. Bldg., Univ. Wisc., Madison, Wisc.

Secretary—Gordon Worley, Memorial Inst. Bldg., Univ. Wisc., Madison, Wisc.

Treasurer—D. G. Frey, 355 Biol. Bldg., Univ. Wisc., Madison, Wisc.

No Report

Eta

President—Jon Malamatinis, 336 Waverly Place, Akron, Ohio.

Vice-President—Mitchell Foss, 1137 Marcy St., Akron, Ohio.

Secretary—Gwenneth Foss, 584 Vinita Avenue, Akron, Ohio.

Treasurer—William Ireland, 461 E. Buchtel Avenue, Akron, Ohio.

On December 8, the following persons were initiated into Eta chapter: Robert Ferris, Guy Romito, Jean Jones, and Patricia Nelan.

During the fall semester, the chapter sponsored a lecture on "Venereal Diseases" by Dr. H. J. Gordon, regional representative of the United States Surgeon-General on the control of venereal diseases. Approximately 500 attended.

Mr. William Ireland was elected delegate to the National Convention held in December. His convention report was read at the January 13 meeting.

At the A. A. A. S. meeting in Indianapolis, Dr. E. P. Jones, assistant professor of Biology, presented two papers entitled "The Potential Longevity of a Paramecium Culture" and "The Unusual Mortality Demonstrated by a Paramecium Culture."

Chapter members are at present working on these research problems: Mr. John Malamatinis, "Life History of Monilia"; Miss Eleanor Mueller, "The Pathogenicity of Monilia"; Mr. Robert Ferris, "Bottom Organisms of Nesmith Lake"; Mr. Guy Romito, "Bottom Lake Bacteria of Nesmith Lake"; Miss Jean Jones, "Variation on the Gram Stain with Varying Concentration of Peptone in the Medium"; Miss Patricia Nelan, "Quantitative Net Plankton Surveys of Nesmith Lake."

PATRICIA NELAN, *Corresponding Secretary*

Iota

President—Kenneth Gayer, Zool. Dept., Washington Univ., St. Louis, Mo.

Vice-President—Ruth E. Peck, Mo. Botanical Garden, St. Louis, Mo.

Secretary—Marian Smith, 6342 Delmar St., St. Louis, Mo.

Treasurer—G. T. Johnson, Botany Dept., Washington Univ., St. Louis, Mo.

No Report

Kappa

President—Charles Wolfson, 227 Snow Hall, Univ. Kan., Lawrence Kansas.

Vice-President—Monti L. Belot, 606 Snow Hall, Univ. Kan., Lawrence, Kansas.

Secretary—Rufus Thompson, 415 Snow Hall, Univ. Kan., Lawrence, Kansas.

Treasurer—Virginia E. Detlor, 1244 R. I., Lawrence, Kansas.

No Report

Lambda

President—Frank Stanton, 540 Daly Ave., Missoula, Montana.

Vice-President—Hervey Sannan, South Hall, Missoula, Montana.

Treasurer—Bob Walker, 532 South Sixth East, Missoula, Montana.

Secretary—Ted Walker, 532 S. Sixth East, Missoula, Montana.

Lambda chapter heard and approved the report of convention delegate Mary Clapp at the first meeting of the winter quarter. At later meetings during the quarter, Professor J. K. Ramskill of the School of Forestry spoke of his botanical experiences in India and Mr. Phil S. Smith, graduate assistant in Biological Science, reviewed recent literature on fish diseases, arousing a lively discussion.

Highlight of the quarter was the initiation ceremony on March 1 for sixteen new members, the largest group ever to be taken into Lambda chapter. After the formal ceremony, a successful banquet was held. New initiates are:

BOTANY:

Duard Hudson

Edwin Stein

Louis Forgey

Dr. Joseph W. Kramer

ZOOLOGY:

Roland Dickman

MEDICAL TECHNOLOGY:

Aloha Hannah

PRE-MEDICAL:

John Seidensticker

FORESTRY:

Halvor Ekern

Alton Knutson

Alfred Graesser

Robert Robbins

Gene Payne

Ralph Clerie

James Ballard

WILD-LIFE TECHNOLOGY:

B. W. Brink

Clarence Graham

Plans for spring quarter include talks by Dr. R. C. Cox of the Rocky Mountain Spotted Fever Laboratory at Hamilton, Montana; Dr. C. F. Deiss, paleontologist at Montana State University; and several student papers; and the annual spring picnic and initiation.

Lambda chapter is proud to claim as one of its charter members, Dr. Philip R. White, who received this year's A. A. A. S. \$1000 award for the most outstanding paper presented at the Indianapolis meetings.

Among recent papers published by faculty members of Lambda chapter is an interesting one by Dr. L. T. Evans, Differential effects of the ovarian hormones on the territorial reaction time of female *Anolis carolinensis*, *Phys. Zoo.* 10(4):456-463, 1937.

TED WALKER, *Secretary.*

Mu

President—Paul De Bach, 112 Agriculture Hall, University of California, Berkeley, California.

Vice-President—William McOmie, 2441 Haste St., Berkeley, Calif.

Secretary—Elizabeth Richardson, 2605 Haste St., Berkeley, California.

Treasurer—William Upholt, 112 Agriculture Hall, University of California, Berkeley, California.

No Report

Nu

President—Arch Logan, Jr., Phi Gamma Delta, Washington, Penna.

Vice-President—R. M. Kiskaddon, 335 E. Wheeling St., Washington, Penna.

Secretary—W. M. McConahey, Phi Delta Theta, Washington, Penna.

Treasurer—R. B. Donaldson, 237 E. Wheeling St., Washington, Penna.

Nu Chapter of Phi Sigma Society has been enjoying an increasingly successful season. Recently seven men were initiated into the chapter because of their interest and ability in various phases of biology, high scholarship, and good character. The initiates are:

J. T. Anderson

W. E. Grubbs

P. J. Baird

J. W. Martin, Jr.

W. H. Everhart

J. R. Sprowls

H. G. Grether

The initiation ceremonies were held in the biology building on February 22. Following this, the entire society had dinner at the Y.W.C.A. At the banquet, Dr. C. D. Dieter, Dr. H. C. Porter, and Mr. W. M. McConahey, Jr. gave short talks. The society went then to the Washington City Hospital to attend a lecture and demonstration by Dr. H. E. Friedlander on "Biophysics". This proved to be a most interesting and instruc-

tive lecture. Dr. Friedlander explained and demonstrated the latest electrical devices for treating disease emphasizing heat therapy especially.

During the year many interesting papers written by the members have been read at the regular meetings. The delegate to the National Meeting at Indianapolis presented his report to the society.

It is the custom of the society to present, every year, a gift to the college. Last year a copy of *Cunningham's Anatomy* was placed in the college library and President Logan has already appointed a committee to select an appropriate gift for the society to donate this year.

W. M. McCONAHEY, Jr., *Secretary*.

PI

President—Morris S. McKeehan, Box 3, Emory University, Ga.

Vice-President—Sterling G. Brinkley, Jr., Sigma Chi House, Emory University Georgia.

Treasurer—Mary Stipe, 1161 Ponce de Leon Ave., Atlanta, Ga.

Secretary—Frances Baker, 1304 Durand Drive, Atlanta, Georgia.

Our February meeting was in the form of an initiation banquet at which we initiated six persons. Dr. John Haldi, Assistant Professor of Physiology in the Emory Medical School, spoke on his research on the Metabolic and Nutritional Relationships of Glucose and Fructose in Mice. Dr. Haldi hopes to correlate his work with the human diet.

Plans are being made for the meeting this month at which time we shall invite the biology concentration students. During one month this spring a meeting will be held in connection with a picnic at some place of biological interest.

Dr. W. B. Redmond, Assistant Professor of Biology, has received an award from the American Philosophical Society for the Advancement of Research. Dr. Redmond is using the award to continue his study of immunity of avian malaria. He received his Ph.D. from the University of Chicago in the summer of 1937.

Of special interest to the Biology Department at Emory are the granite outcrops near Atlanta. On the largest of these, Stone Mountain and Mt. Arabia, are found several endemic species of plants. Among these are *Amphianthus pusillus*, *Dimorpha cymosa*, and *Isoetes melanospora*, which are to be used as subjects of Master's theses. The morphology and cytology of these plants, properly worked out, would be an interesting contribution to biology.

The following persons were initiated on February 23:

A. E. Cannon
Christiann Dugger
Peter Hydrick

J. Robert Jordan
Merrill Leinbach
Charles Uhl

Pi chapter has received definite benefit from the contacts established during the recent National Meeting at Indianapolis.

FRANCES BAKER, *Chapter Secretary.*

Rho

President—Ralph Dexter, 301 Nat. Hist. Bldg., Urbana, Illinois.
Vice-President—Virginia Ganstad, 200 Nat. Hist. Bldg., Urbana, Illinois.
Secretary—Wm. Marberry, 204 Nat. History Bldg., Urbana, Illinois.
Treasurer—Margaret Middleton, Nat. Hist. Bldg., Urbana, Illinois.

No Report

Sigma

President—Lewis Berner, Biology Dept., Univ. Fla., Gainesville, Fla.
Vice-President—E. Van Lear Lipscomb, Bacteriology Dept., Univ. of Fla., Gainesville, Fla.
Secretary—Miss Kathleen V. Wheeler, Entomology Dept., University of Fla., Gainesville, Fla.
Treasurer—Murrill C. Futch, Animal Husbandry Dept., Univ. of Fla., Gainesville, Fla.

Although the members of Sigma Chapter planned to confine their programs entirely to the work of our student members we felt justified in deviating from this plan at our last meeting. Since we were so fortunate in having Dr. Emmel on our Campus we invited him to present a phase of his work to us. I am sending herewith a brief of his lecture and hope that you will be able to place it in the next issue of The Phi Sigma Quarterly.

We plan for our next program an "Ecology Trip" and hope that we may be able to send you an interesting account of our explorations together with some snapshots of Sigma Chapter at work.

Sincerely yours,

KATHLEEN VERTREES WHEELER, *Secretary of Sigma Chapter.*

Tau

President—Kenneth H. Garren, Dept. of Botany.
Vice-President—George W. Wharton, Dept. of Zoology.
Secretary—Sarah Culbreth, Dept. of Zoology.
Treasurer—Katherine Goffin, Dept. of Zoology.

Duke University is opening a new Marine Laboratory in the summer of 1938. The departments of Botany and Zoology are cooperating on the

project, and we feel that some news concerning this new biological station will be as interesting to the other chapters of Phi Sigma as it is to Tau.

The laboratory is situated at a spot of considerable biological interest from a faunistic and floristic viewpoint, as well as from an historical viewpoint.

In 1902 the United States Bureau of Fisheries established a research station on Piver's Island, just 150 yards from the old town of Beaufort, because this locality was particularly favorable for the study of marine flora and fauna. Many eminent biologists have worked at Beaufort, both before and after the Government station was built. Among these might be mentioned Gill, Stimpson, Coues, Yarrow, Brooks, Wilson, Mast, Hoyt, Lewis, Hay, etc. The works of these and other biologists at Beaufort add to the biological interest of the animals and plants in this region.

We have had personal experience with the surrounding country, and know that any biologist would be favorably impressed by the abundance and diversity of biological material: The zoologist will find a variety of marine forms, several of which are not found further North. These are sea urchins, starfish, spatangoids, clypeasteroids, clams, oysters, barnacles, conchs, turtles, sharks, bryozoans, corals, sea anemones, jelly fish, crabs, shrimps, stomatopods, polyclads, ascidians, porpoises, and many other forms. The Gulf Stream is in easy reach of the station and there are many interesting tropical and sub-tropical species as well as game fish in these waters. In the fresh water streams and rivers, and brackish and fresh water swamps there are also many interesting forms. The botanist likewise has an interesting array of material on which to work. The marine algae are very abundant here and many of the tropical and sub-tropical genera are present which are not present further north. Among these might be mentioned the Dictyotales, represented by four genera, three genera of the greens, *Udotea*, *Caulerpa*, and *Codium*, and the red alga *Chrysomenia*. On the land and in fresh water there are other interesting groups. Venus' fly trap is a native of this section of Carolina.

The Duke University Marine Laboratory is situated on the south half of Piver's Island. On the north half is the government station. There are now under construction a laboratory, lecture and recreation hall, dining hall, boat house, dormitories, pump house and pier. The laboratory will be furnished with running salt and fresh water and suitable tanks for maintaining live specimens. All of the buildings will have electricity. There is parking space for cars and a bridge to the island which connects to highway U. S. 70.

Although the station is separated from the mainland, and is quite undisturbed by people from the outside it is near enough to town so that it is not necessary to ride into town. For those students who like a bit of recreation there are four theaters within five miles of the island as well as a beach with a board walk, dancing pavilion, bowling alleys, etc.

Two courses are going to be taught in the summer of 1938. One in botany and the other in zoology. These courses will each give 6 hours credit. In addition special problems and research may be undertaken under members of the staff.

Dr. H. L. Blomquist, Chairman of the Duke Department of Botany is conducting a study of the structure and classification of the marine algae. Dr. A. S. Pearse, Director of the station and Chairman of the Zoology Department, and Dr. I. E. Gray are giving a course in marine zoology including the life histories, classification, and ecology of marine animals.

Further information concerning the laboratory can be had from the Duke University Summer School office, Durham, N. C.

Tau Chapter has had several interesting lectures on the winter program.

G. W. WHARTON, *Vice-President*.

Upsilon

President—James Cattell, 110 Elliot Hall, Miami University, Oxford, Ohio.

Vice-President—Kenneth Penrod.

Secretary—Roger Williams, 212 Swing Hall, Miami University, Oxford, Ohio.

Treasurer—James Fisher.

Upsilon Chapter is pleased that the interest in its meetings has increased during the academic year 1937-38. The cause for this most fortunate change is due to our program of bringing off-campus authorities to the University in an effort to stimulate student's interest in the importance of the study of biology. We are also fortunate in having acquired a room in the biological science building, which we may call our own, a place where our records etc. may be safely kept.

Recent off-campus speakers, whom we have had the pleasure of hearing are: Dr. R. M. Cable of Purdue University whose topic was "Life Cycles of Rare Parasites," and Dr. A. G. Lang of Carolina State College, who spoke on the "Origin of Cotton Fibers."

We are at present planning our annual spring field trip to some not distant place, rich in biological lore.

On March 18, 1938 we are planning to initiate the following persons:

Julia Bullock	Alice Heide
Wendell Cook	Charles Heintzelman
Betty Cunningham	Mary Helmkamp
Paul Davis	Gerald Lester
John Ellis	Emilia Myers
Ernest Fox	Doris Rohn
Roger Harned	Katherine Shafer
Elmer Headrick	George Spohn

Following the initiation ceremony and banquet, Dr. F. A. Hitchcock of Ohio State University will speak to us on "The History of the Development of Nutrition and Metabolism."

ROGER WILLIAMS, *Secretary Upsilon Chapter.*

Phi

President—Miss Eleanor Sheehan, Zoology, University of New Hampshire, Durham, N. H.

Vice-President—Alfred Chandler, Zoology, University of New Hampshire, Durham, N. H.

Recording Secretary—Mrs. Patricia MacLeod, Bacteriology, University of New Hampshire, Durham, N. H.

Treasurer—Miss Mary Tingley, Horticulture, University of New Hampshire, Durham, N. H.

Corresponding Secretary—Joseph Naghski, Bacteriology, University of New Hampshire, Durham, N. H.

Phi Chapter has had a very busy season. The new members have caught on to the spirit of Phi Sigma and have helped to build and maintain it. Spring elections of new members is approaching and it is hoped that if any new members are taken in, they will be amalgamated as successfully as the former ones have.

On Nov. 17, at an open meeting, Mr. Carl Hoover, Biologist of the Fish and Game Dep't, gave an illustrated lecture on Fish and Fishing, in which he presented the progress of the survey of fish life in New Hampshire waters. In this lecture he pointed out how very little experimental work has been done on the environmental requirements of the various fishes used to stock our lakes and streams.

On Jan. 12, Miss Sheehan, our delegate to the National convention gave an account of the meetings and every one was pleased with the changes brought about by the convention. Also at this meeting, Dr. Chapman of the Geology Department and member of Phi Sigma, gave an illustrated account of the Moscow Congress of Geologists. He especially

stressed the tours through the Caucasian Mountains and the Province of Georgia taken before the sessions and the tour after the sessions taken to northern regions, especially investigating the geologic formations on the island of Nova Zembla, the land of the midnight sun.

On Feb. 23, the annual "Pre-Med Night," sponsored by Phi Chapter of Phi Sigma, was held at the Commons Organization Room. Dr. Oberlander, the newly appointed University Physician, addressed the Pre-medical students and gave some pertinent advice to those who intend to pursue further study of medicine.

At the other meetings, members have presented papers of a less serious note and duration, but which can be said to be conducive to the scientific spirit.

Committees are now planning the annual spring outing. This will be held as soon as the weather permits and will in all probability be a week end mountain trip. Alumni members are cordially invited and their presence appreciated since they make very good campfire entertainers. We are looking forward to seeing further issues of the new Biologist.

JOSEPH NAGHSKI.

Chi

President—Peter Matischeck, Lewis Hall, Bozeman, Montana.

Vice-President—John Buzzetti, Sigma Chi House, Bozeman, Montana.

Secretary and Treasurer—Veda Jacobs, 520 West Main, Bozeman, Montana.

No Report

Psi

President—Samuel Hutchinson, Dept. of Fisheries, University of Washington, Seattle, Washington.

Vice-President—Clarence Stone, College of Forestry, University of Washington, Seattle, Washington.

Secretary—Margery Myers, Dept. of Zoology, University of Washington, Seattle, Washington.

Treasurer—Charles Wilson, College of Pharmacy, University of Washington, Seattle, Washington.

Psi Chapter of Phi Sigma has little for the "Biologist" at this time. We wish to report, however, that we have elected a new vice-president, Miss Julia Goodsell of Physiology, and a new Treasurer, Mr. Falconer Smith of Zoology.

Our fall initiates were sixteen in number, three of them faculty members. They were distributed among the various departments as follows—

BACTERIOLOGY:

Betty Baxley

Walter Leif

Edna Robinson

FISHERIES:

Clinton Atkinson

Heward Bell, faculty

Henry Dunlop, faculty

FORESTRY:

William Davies

PHARMACY:

John Ellegood

Tom Iriye

Abraham Krems

PHYSIOLOGY:

Frances Barton

Dr. Arthur Martin, faculty

Douglas Murray

ZOOLOGY:

Kazuo Fujihira

Eloise Kuntz

Alice Ogden

Yours sincerely,

MARGERY MYERS, *Secretary, Psi Chapter.*

Omega

President—Maxwell Power, Zoology, Univ. of Okla.*Vice-President*—Eleanor Galloway, Botany, University of Oklahoma.*Secretary*—Mildred Hawkins, Botany, University of Oklahoma.*Treasurer*—Fred Aurin, Zoology, University of Oklahoma.

Omega Chapter has been trying coffee hour discussions in the way of open meetings and they have proved very successful. Each one has been better attended than the previous one. The first coffee hour was held immediately following the National Convention, and at this meeting Charles Smith, the official delegate, gave reports from the convention. Maxwell Power discussed some of the more interesting meetings of the other scientific organizations. Three of the graduate students, each representing a different department, spoke on their research. Miss Eleanor Galloway, Botany Department, spoke on Pollen and Glaciation. Miss Martyna Garrison of the Paleontology Department, talked on Micropaleontology. And Mr. Kenneth Richter, graduate student in Zoology, gave a report on the research he has in progress on the Golgi Apparatus Behavior in *Notanecta*.

The Dedication program of the new Biology Building will be partly planned and managed by the members of Phi Sigma. The annual Phi Sigma initiation and banquet will be March 25. Dr. L. L. Woodruff, Professor of Protozoology at Yale University, who will deliver the Phi Sigma initiation lecture and the dedicatory address, is to be initiated into honorary membership.

The candidates for this spring initiation have been elected. They are Mrs. Dorothy Leake, who is of the faculty of Southeastern State

Teachers College, Durant, Oklahoma; Miss Marcelotte Leake, Mr. Reginald Hoeker of the Botany Department; and Hubert Anderson, Ralph Anderson, Verne Epley, Worth Gross, Ruth Irby, Russell Kreger, William McPherson, Rose Mussa, Donald Olson, Adrian Van Herwynen, Elaine Walker, and Dr. Phillip Levereault of the Department of Zoology.

Yours respectfully,

MILDRED HAWKINS, *Secretary Omega Chapter.*

Alpha Alpha

President—P. J. Rempel, 1051½ W. 35 St., Los Angeles, California.

Vice-President—Douglas Pearce, 722 W. 76th Street, Los Angeles, California.

Secretary—Carolyn E. Barnes, Dept. Zool., Univ. S. Cal., Los Angeles, Calif.

Treasurer—Nathan E. Carl, 1547 W. 45th Street, University Southern Calif., Los Angeles, California.

The Winter Initiation-Banquet for Alpha Alpha chapter of Phi Sigma was held Friday evening, February 11, 1938 in the Foyer of the Town and Gown, University of Southern California. At the formal Initiation preceding the banquet the following persons were initiated into the society with impressive ceremonies:

Mr. James Aiken
Mrs. Blanche Bobbitt
Mrs. Florence Buel
Mr. Maxwell Carl
Mr. George Ford

Miss Ruth Huff
Mr. Harold Mitchell
Mr. William Newman
Mr. John Wilson

Dr. Howard De Forest represented the Faculty in the ceremony of initiation.

Following the initiation and dinner the society was fortunate to hear Mr. Walter Armacost, an internationally famous breeder and culturist of orchids, speak on "The Practical Aspects of Orchid Culture." Mr. Armacost illustrated his talk with specimens which he had produced from his work. The various stages in the raising of an orchid from seed to mature plant were represented. The seeds are grown in liter Erlenmeyer flasks on a gelatin material for their first year of life. After this time they are taken out of the flasks and transplanted into little individual pots on a special type of moss for culture of orchids. As they grow from their small size to maturity they are placed in larger pots. After seven years approximately they may be expected to produce a flower such as any lady would be proud to wear as a corsage. After the talk guests were allowed to handle and examine the beautiful plants as much as they

cared to. Several outdoor species which can be grown in outdoor gardens without any trouble whatsoever were shown.

For the March meeting, the Society has been invited to be the guests of the Los Angeles County Museum at Exposition Park Friday, March 11, 1938.

CAROLYN BARNES, *Secretary*.

Alpha Beta

President—John P. Smith, Sigma Nu, Mt. Union College, Alliance, Ohio.
Vice-President—Robert Maurer, Sigma Nu, Mt. Union College, Alliance, Ohio.
Secretary—Jane Dugan, Beloit, Ohio.
Treasurer—Cornell McFadden, Sigma Nu, Mt. Union College, Alliance, Ohio.

Alpha Beta chapter of Phi Sigma held formal initiation on January 6, 1938. The following people were made active members:

John Cottrell	Canton, Ohio
Eleanor Iman	Crestline, Ohio
Evelyn Martin	Alliance, Ohio
Dorothy McConnor	Salem, Ohio
June McMillan	Alliance, Ohio
Martha Smith	Mingo Junction, Ohio
Harold Yeager	Marion, Ohio

At our last meeting, Dr. Perry King, who is a local physician, gave a very interesting lecture on cancer. He discussed several theories as to the cause of cancer. He stated very definitely that the actual cause of cancer is unknown. He then discussed the various types of the disease. He told of the different places in the body where cancer may occur, and told how these parts are affected. During the lecture, he showed lantern slides of tissues affected by cancer. He explained the surgery of internal cancer, especially of the stomach. X-ray films of parts of the body where cancer was involved were shown to us. The doctor then discussed the curative methods used today. He also mentioned several outstanding research workers and their accomplishments in cancer studies. Dr. Scott, who is our faculty advisor, further discussed research in cancer and showed microscope slides.

Sincerely yours,

JANE DUGAN, (*Corr. Secretary*).

Alpha Epsilon

President—Dr. Edna Higbee, 1009 Cathedral of Learning, University of Pittsburgh.

Vice President—Mr. Philip Walker, 1009 Cathedral of Learning, University of Pittsburgh.

Secretary—Mr. Herbert McCullough, 1009 Cathedral of Learning, University of Pittsburgh.

Treasurer—Dr. William Starkey, 1009 Cathedral of Learning, University of Pittsburgh.

At the beginning of last semester Mr. Kenneth Bergstresser was forced to resign his position as vice president because of his receiving an appointment to the Biology Department of Beaver College, Jenkintown, Penna., which would keep him from remaining active here. Mr. Philip Walker was elected to fill the vacancy.

Dr. O. E. Jennings, head of the Biology Department and a faculty member of our chapter, has resigned his position as editor of the *Bryologist*, publication of the Sullivant Moss Society. The press of other duties forced Dr. Jennings to tender his resignation but he has agreed to continue as associate editor. Soon afterwards Dr. Jennings was appointed to the editorial board of *Ecology*.

Alpha Epsilon Chapter has been having some excellent meetings. At the meeting of December 10th, Mr. H. N. Ott, president of the Spencer Lens Company, gave a very interesting discussion of the history of the microscope both in Europe and America.

On December 16th the chapter was guest of Collembolae, undergraduate honorary fraternity at the University of Pittsburgh. At that time Mr. Chester Henry spoke on Biological Applications of X-rays.

The next regular meetings was on January 14th, when Dr. R. A. Waldron of Slippery Rock State Teachers College spoke on his travels in Mexico. Dr. Waldron illustrated his talk with colored movies and lantern slides.

At the meeting of February 11th we reciprocated with Collembolae by having them as our guests. At this meeting Dr. J. L. Kelso, archaeologist at the Pittsburgh Xenia Seminary spoke on his excavations in Palestine. The talk was illustrated with lantern slides.

HERBERT McCULLOUGH, *Secretary*.

Alpha Zeta

President—Herbert Jemmott, Williamsburg, Va.

Vice-President—Kathleen Peek, Williamsburg, Va.

Secretary—Katharine Norfleet, Williamsburg, Va.

Treasurer—Frank Koss, Williamsburg, Va.

Alpha Zeta initiated the following into active membership this Fall:

William Anderson	Katharine Norfleet
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Caroline Burpeau	Torsten Peterson
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Compton Crook (Faculty)	Jean Snyder
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Frank Koss	Harold Turner
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Dr. Raymond L. Taylor gave a very interesting talk at one of the meetings on Human Brain Potentials or "Brain Waves".

Miss Mary Eleanor Davis was our delegate to the National Convention in December.

Sincerely,

KATHARINE NORFLEET, *Secretary*.

Alpha Eta

President—Gerald Steelman, 223 Elm Street, Stillwater, Okla.

Vice-President—Aaron Seamster, 219 Duck St., Stillwater, Okla.

Secretary—Susann Fry, Murray Hall, Stillwater, Okla.

Treasurer—Tom Graham, 713 College Ave., Stillwater, Okla.

The following were initiated into Alpha Eta Chapter on November 7, 1937:

Henry Lee Sweezy	Aaron Seamster
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Melvin Hazeleous	Bill Hill
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Harold Bush	Betty Goltry
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Abbott Kagan	Lester Gordon
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Martin Kagan	Vernon Horn
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Gene Farrington	Robert Kaiser
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Darrell McLean	Pat Hedges
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James Holley	Floyd Pond
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Floyd Miner	Gaines Eddy
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Leon Sonntag	Robert Massengale
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At a banquet honoring the new members, Professor R. O. Monosmith of the Horticulture department spoke on "A New Start In Life for Plants." He demonstrated the difference in the roots of plants which had been treated with an auxin and those grown in an ordinary sand culture. The banquet table was decorated with huge mums which had

been treated and grown in a sand culture at the A. and M. greenhouse.

In the Honors Day convocation on May 19, this chapter will award a plaque to the student who has submitted the best paper on an original biological research problem. First and second honorable mention will be announced if the number and quality of papers warrant it. The papers, accepted from the campus at large, are to be judged by a committee from the biological science faculty. Papers are to be rated on the bases of originality, correct form, suitability for publication and contribution to knowledge.

Faculty members belonging to Phi Sigma are showing their interest in the contest by presenting the chapter with a permanent plaque on which the name of each year's winner will be engraved.

Professor J. C. Shirley of Phillips University at Enid will be the guest speaker at the March meeting.

The chapter regrets the loss of its president, Ray Murrell, who has accepted a position at Cameron Agricultural College, Lawton, Okla.

SUSAN FRY, *Secretary*.

Alpha Theta

President—Jack R. Nail.

Vice-President—Stanley G. Mittelstaedt.

Secretary—Irwin M. Newell, c/o Dr. E. O. Holland, Pullman, Wash.

Treasurer—Paul R. Kramer, Box 744, College Sta., Pullman, Wash.

Alpha Theta chapter is again sponsoring Natural History Club this year, with Stanley Mittelstaedt as chairman. Natural History Club is presenting a series of programs of talking pictures on interesting biological and other subjects. We find that these programs are quite well attended, and are looked forward to by both faculty and students.

Plans have been made already for the Snake River trip, which is being sponsored by our chapter. This trip is primarily a field trip for biological science majors, but it also provides a week-end of entertainment. This year the trip is to be taken from April 27 until May 1. The group taking the trip will start from Lewiston, Idaho, and go by boat about one hundred miles up the Snake River; when the destination is reached, a camp is pitched and three days of fun ensue. The cost, including transportation, is not to exceed ten dollars per person.

Sincerely yours,

HELEN PETERSON, *Secretary*.

Alpha Iota

Secretary—J. H. Kantor, 5 North 3rd St., Lewisburg, Pa.

Alpha Iota at last seems to be coming out of its lethargy in the matter of reporting chapter news. Under the leadership of a few graduate students, and the faculty members, the chapter is reviving steadily. Monthly dinner meetings have become a regular feature of the chapter's activities. Usually the chapter brings to the campus on these occasions some noteworthy speaker. On the 9th of March, our guest was Dr. G. N. Ballentine, '30, who spoke on "The Relationship of Social Diseases to Problems in Obstetrics" before the general student body. Dr. Ballentine served as school physician during the fall and winter months during the illness of the regular physician, Dr. Lester P. Fowle.

Alpha Iota will sponsor Dr. Roemmert on the campus on March 29th. At that time, Dr. Roemmert, famous for his projection apparatus for living micro-organisms, will demonstrate his material.

At recent meetings, several interesting papers were given by members and candidates for membership. Mr. William Clemens, our chapter president, gave an illustrated talk on "Comparative Embryology of the Chick and the Pig," at the February dinner meeting.

Mr. Alvin Nathanowitz, '38, presented his findings on "The Isolation and Study of Non-Acid Producing Organisms in Pasteurized Milk and those Causing Ropiness in Milk". Mr. Alden S. Thompson, '37, delivered a paper on "Study in Differentiation of *Escherichia Coli* and *Aerobacter aerogenes* by Bacteriostasis". The latter two papers were presented as requirement for membership. Fifteen other students are working on problems in connection with Phi Sigma membership, and these reports are being presented at the regular meetings, as time allows. We hope to have these fifteen students ready for the spring initiation.

At the next regular meeting, papers will be presented by Miss Laura Haines, '37, on "Local Ferns around Bucknell University", and by Mr. Elwood Kerstetter, '37, on "Comparative Morphology of *Tagetes erecta* and *Tagetes patula*, and the interspecific hybrid". Both of these will be presented for membership.

The omission of the G. A. A. has found a favorable response at Alpha Iota. We hope that it will be unnecessary to resume the fee at the end of the trial period.

Due largely to the efforts of Dr. N. H. Stewart, Professor of Zoology and Embryology, Bucknell University will play host to the spring meeting of the Pennsylvania Academy of Science on April 15-16. Several

members of Alpha Iota are members of the P. A. S., as is the entire Biology Faculty. This should be an excellent chance to stimulate research, and Alpha Iota should profit by the opportunity.

JEROME H. KANTOR, *Vice-Pres., Alpha Iota.*

Alpha Lambda

President—Paul E. Nielson.

Vice-President—Elizabeth S. Hansen.

Secretary—Albert W. Grundmann.

Treasurer—Marian Woodbury.

We have just returned from our annual fall trip taken up one of the local canyons where we spent a very enjoyable day. Last spring we also spent a day in the canyon as a spring trip. A good number of faculty and active members were present on both occasions.

We have had several interesting meetings at which the following speakers were presented: Dr. R. G. Frazier, who spoke on "Going down the Grand Canyon of the Colorado and the Impassable Canyon of the Salmon River by Boat" (illustrated); Dr. O. A. Ogilvie, who discussed "Cancer"; and Dr. G. A. Matson, who discussed "Blood Grouping in the American Indians and Mummies" (illustrated).

The annual initiation banquet and ball of the Alpha Lambda Chapter was held February 26, 1938, at the Art Barn. Mr. Stephen D. Durrant was the toastmaster, and a delightful program was presented to the many alumni and members who were present to honor our new initiates. The following were initiated:

John William Allen	Elwood Kreutzer
Bruce Balken	Frank Loomis
Reed Broadbent	Shirley Oleson
Irvine Bills	Virginia Oleson
Henry Shirl Coleman	Geno Saccamanno
Bernard Ellison	Frances Swift
John C. English	Helen Vance
Ross Hardy	Rulon Wells
James Hilton	George Willis
Ella May Johnson	Tyler Wooley
Loretta Johnson	

At our semi-monthly meetings we have enjoyed very good addresses by which we have all benefited. Some of the speakers have been: Gerald Thorne, of the U. S. Bureau of Nematology, "Plant Nematodes"; Lee

Kay, of the State Fish and Game Commission, "Wild Life Conservation", which he illustrated with exceptional techni-color motion pictures: Elmer Smith, "The Relation of Cultural and Physical Anthropology"; and Dr. Charles Blumenfeld, who gave a delightful lecture on "The Mitotic Aspects of Cancer".

Fraternally yours,

ALBERT W. GRUNDMANN, *Secretary, Alpha Lambda Chapter.*

Alpha Mu

President—John M. Pierson, Department of Zoology.

Vice-President—Dean Painter, Fish and Game.

Secretary—Clara Chapman, Department of Botany.

Treasurer—Frederick Cramer, Fish and Game.

On February 16th, 1938, Alpha Mu sponsored an open meeting at which Dr. Nathan Fasten, head of the Department of Zoology, gave an illustrated picture. The topic was "Twins, Multiple-births, and Monsters". This field is one in which Dr. Fasten is especially interested and in which he has contributed a number of articles and a book.

The following were initiated on January 26th, 1938:

Ivan Donaldson

Dan Slater

Arthur Hutchinson

Sam G. Wildman

Robert Johnson

Howard Youse

Dr. Roger Williams

Alpha Mu is proud to have Dr. Williams as an Honorary Member. Dr. Williams was born in Ootacumund, India, obtained his Ph.D. from Chicago, and since 1929 has been professor of chemistry at Oregon State College. Some of his fields of research have been bios and other yeast nutrilites, correlation of organic with inorganic compounds, and the adsorption of organic ampholytes. Recently Dr. Williams received a Rockefeller Foundation Grant amounting to \$20,000, and in addition Oregon State System of Higher Education has contributed a substantial sum. These grants are to enable Dr. Williams to continue his research on pantothenic acid and its effects on life.

At the initiation banquet Banner Bill Morgan, our convention candidate, spoke on the transactions of the National Convention.

As an initiation requirement candidates must write a paper of at least 1000 words. At the first regular meeting following initiation two papers, selected as the most outstanding, were read. These were "The

Nature of a Virus" by Sam G. Wildman and "The Need of a Migratory Waterfowl Program" by Arthur Hutchinson.

On March 2 Alpha Mu is having a forum meeting. The topic is "The Philosophy of Biology". Dr. Donald Rogers and Dr. Alfred Taylor, both members of Phi Sigma, will present twenty minute talks, after which there will be a general discussion of the topic.

Plans are now being made for an open meeting in Spring Quarter, the title of which is "Whither Mankind?" The topic will be treated from the following aspects: genetics, adjustment, and moral and spiritual evolution.

CLARA CHAPMAN, *Secretary*.

Alpha Nu

President—Martin W. Fleck, 704 Ridgecrest Drive, Albuquerque, N. M.

Vice-President—Carolyn Miles, 1400 East Roma Ave., Albuquerque, N. M.

Secretary—Charlotte Goodding, 123 Vassar Ave., Albuquerque, N. M.

Treasurer—Mollie Elizabeth Gordon, 1108 East Grand Ave., Albuquerque, N. M.

Alpha Nu Chapter, located on the campus at the University of New Mexico in Albuquerque, started the new year's program by having the report of the delegate to the National meetings in Indianapolis, Charlotte Goodding, as well as a report from Dr. E. F. Castetter, who also attended the AAAS meetings. The suggestions, ideas and enthusiasm brought back to the Chapter have and should be valuable in increasing interest in the activities of the local group.

"The History of the Adelie Penguin" was the subject chosen by Howard Campbell, graduate fellow, for the meeting on February 3. The report was based upon a book written by an English antarctic explorer. Lantern slides of the penguins, their native home, habits, etc., added special interest to the paper.

Dr. E. F. Castetter, head of the U. N. M. Biology Department, was the speaker on Feb. 17. His remarks entitled "The History of Biology" pointed out the various trends along which the biological sciences have developed, especially in more recent times, as well as the development in various national groups.

In keeping with the emphasis on ethnobiology at the University and with the southwestern life, Alpha Nu featured an unique program on March 3. Twenty guests attended a Navajo supper at the home of one of the members. Through the cooperation of the Albuquerque Indian School and Mr. Earle Dexter, religious worker with the Indians, we se-

cured four Navajo Indian girls, dressed in their native costumes who prepared and served the food such as is eaten by the southwestern Indians.

Included on the menu were Navajo fried bread or squaw bread as it is sometimes called, fried mutton, coffee, corn, tea, and fruit pudding. The enclosed menu gives the Navajo names for the food. (The last item is ice cream, which was not served). Sitting on the floor on Navajo rugs, guests ate in typical Indian fashion. The Indian girls entertained by singing a native song taken from one of the tribal ceremonial dances. Dr. E. F. Castetter spoke briefly on the foods of the Indians, emphasizing the plants used by the Navajoes. Indian games concluded the program. New members were elected at the business meeting which followed. April 21 is the date chosen for the initiation banquet at which Mr. M. E. Musgrave, of the Soil Conservation Service, will speak on Indian Agriculture.

The program for the remainder of the school year will include several student papers, one on the origin of the turkey in North America by James Spuhler, another on "The Aboriginal Uses of Cacti" given by Theodore Norris, graduate fellow in Biology, and "The Eradication of the Dandelions from Lawns" by Robert Hanks, a graduate fellow in biology. These papers represent special problem work, the last two as work toward master's degrees.

A party and a biology department picnic are also on the calendar for April 1 and May 6 respectively. The year's activities will be concluded with an half-hour radio program over KOB (one of the NBC stations) on May 31.

The increased attendance and the enthusiastic response of the members indicate that Alpha Nu Chapter has had a better year than last. The new officers who are to be elected at the meeting on March 17 have a good foundation for a very fine year ahead.

MARTIN W. FLECK, *President*.



BOOK REVIEWS

The thumbnail sketches of current biological literature appearing in this section are not meant to be exhaustive or deeply critical. They aim to survey the rapidly growing field of biology. Naturally these reviews represent the candid opinions of various readers not necessarily those of members of the National Council, nor even those of the Editor.

AFRICA'S GOD, JOSEPH J. WILLIAMS,
Boston College Press, Chestnut Hill,
Mass., 1937. \$1.00.

This contribution to a series previously reviewed is much more interesting to the average reader than the painstaking compilation of anthropological data which characterized its predecessors. Here one comes onto unmistakable evidences of a prehistoric monotheism which is hard to trace. Dr. Williams adduces the testimony of several anthropologists to show how the various scatterings of the pre-Christian Hebrew groups may account for it.

ATLAS OF CAT ANATOMY, D. B. HORSBURGH AND J. P. HEATH,
Stanford University Press, Stanford University, California, 1938. \$1.00.

Anyone who has tried to take a fairly young group of undergraduates through the anatomy of the cat without some such comprehensive atlas as this, knows what a task it is. Every available anatomy is ransacked, and a whole stack of books is generally necessary in order to get a complete series of sketches together in order that the class may get some adequate understanding of what they are supposed to see in their laboratory work. All this difficulty is obviated for the student, or the instructor, who has this adequately large atlas with its simple, almost schematic illustrations as a guide.

BENEATH THE SURFACE, H. E. TOWNER COSTON,
Charles Scribner's Sons, New York, 1938. \$2.00.

Hydrobiology of English rivers told in an engaging and unpretentious way. Not too scholarly in its methods, (there are no references or bibliographies,) this work is a decided asset to our conservation literature. It tells the

story of river life in words the layman will understand. As such it will make a good public or school library book. It would also be a good book to present to a fisherman.

BIOLOGICAL STANDARDIZATION OF THE VITAMINS, KATHARINE H. COWARD,
William Wood and Co., Baltimore, 1938. \$4.50.

Advanced students of dietetics, research workers in biochemistry, and commercial manufacturers of therapeutic preparations will find this a valuable laboratory reference work. It is wisely divided into two main parts, the first dealing with detailed instructions for the determination of vitamins A, B, C, and D. The second part treats statistically of the accuracy obtainable in the foregoing determinations.

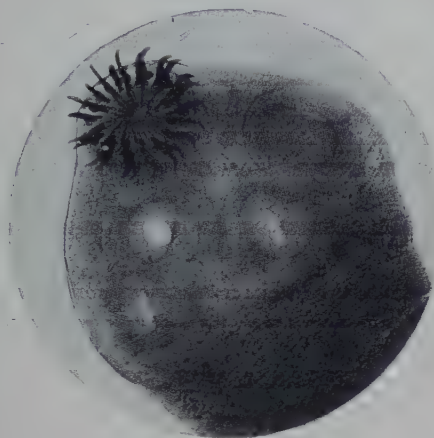
THE BRAIN AND ITS ENVIRONMENT, JOSEPH BARCROFT,
Yale University Press, New Haven, 1938. \$2.00.

Last year's Terry Foundation lectures are here produced for the general public. Sir Joseph Barcroft, the professor of physiology at Cambridge, under the headings: The Activity of the Brain in Mid-Foetal Life, The Activity of the Brain at Birth, and, Mental Efficiency Considered in Relation to some Properties of the Blood, —considers the various conditions affecting the development of the human brain.

THE CALL OF THE KOALA, AMBROSE PRATT, Robertson & Mullens, Ltd.,
107-113 Elizabeth St., Melbourne, Australia, 1937. 6/-

It is a far cry from the vigorous presidential personality whose name lives on in the "Teddy Bear" to the living prototype of the curiously lovable plaything. The Australian koala is a vanishing race of animals

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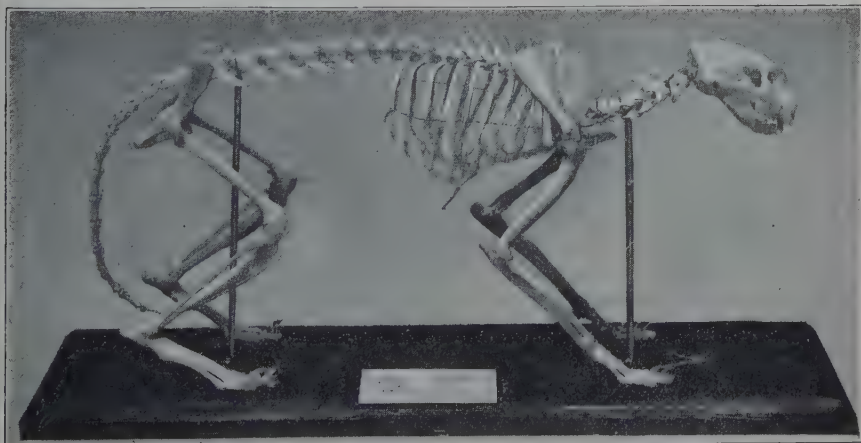


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DENOYER-GEPPERT COMPANY
5235 Ravenswood Ave., Chicago

which have become as distinctive of the island continent as the kangaroo. Covering the life history, the etiology, and the behavior of these little Antarctic marsupials, this book deserves to be in every biological library,—if not for its scientific facts and interests,—at least for the sentimental reason that all proceeds from its sale are being devoted to the preservation of the species.

THE CARBON COMPOUNDS, C. W. PORTER, *Ginn and Company, Boston, 1938. \$4.00.*

This third edition of a justly favored textbook contains more than sufficient matter for an up-to-the-minute course in the carbons. Constant cross-referencing to the literature as well as treating general principles involved in all organic syntheses in a separate section of the book are valuable features. More stress could have been placed on the commercial preparation of the more important compounds. It might also have been preferable to have opened the text with a brief survey of the typical paraffin hydrocarbons, thus introducing the student to organic chemistry through a study of the reactions of functional groups which are to be encountered later, and affording an easier transition from inorganic to organic chemistry. The text is remarkably free from errors, the printing excellent and the structural formulae compactly condensed as far as possible.

CLAUDE BERNARD, PHYSIOLOGIST, J. M. D. OLMSTED, *Harper & Brother, New York, 1938. \$4.00.*

As Alexis Carrel points out in a laudatory foreword to this book, Claude Bernard was the first French scientist to be accorded a national funeral, a well-deserved honor for the man who made medicine an experimental as well as an empirical science. In his very interesting life of Bernard, Dr. Olmsted has requited himself well of a subject whose life has gone too long unnoticed, eclipsed, perhaps, by the glory of his illustrious contemporary, Pasteur. The shelves in the biological and medical history section of your library need this book.

AN ECOLOGICAL GLOSSARY, J. RICHARD CARPENTER, *University of Oklahoma Press, Norman, Oklahoma, 1938. \$4.00.*

The development of the old plant and animal ecologies into what bids fair to be another important branch of the biological sciences, bioecology, has brought with it an unexpected amount of new terminology. The result is quite confusing even to the trained biologist who turns to the new bioecological literature for information.

This book from the University of Oklahoma Press blazes a way through the tangle of overlapping and synonymous terms. If it were only an ecological dictionary it would be worth having. The additional historical bibliography, and the collection of floristic and faunistic maps also included make it simply invaluable. No biological library can afford to be without it.

THE ESSENTIALS OF HUMAN EMBRYOLOGY, GIDEON S. DODDS, *John Wiley & Sons, New York, 1938. \$4.00.*

This is a revised second edition of the original work which appeared in 1926. It has been somewhat expanded, and the newer results of sex-hormone research have been incorporated. With an illustration or diagram for nearly every alternate page it supplies about all the visual as well as textual matter necessary for a thorough understanding of the subject.

THE FIGHT TO LIVE, RAYMOND L. DITMARS, *Frederick A. Stokes Co., New York, 1938. \$2.50.*

The fecund Mr. Ditmars has produced another animal book which does him no discredit, and will make many a friend both for its author and the interesting animals he describes. His theme in this volume is the struggle for existence that goes on in nature. He takes up the thread of his narrative with the apes, and pursues it down the scale of life to the insects. The observations of a life devoted to zoological study here appear in a most attractive guise.

THE FIGHT FOR LIFE, PAUL DE KRUIF, *Harcourt, Brace & Co., New York, 1938. \$3.00.*

Selected by the Book-of-the-Month Club as its May offering, Paul de

BLAKISTON BOOKS for BIOLOGISTS

The following have been found to be outstanding textbooks

BREMER—TEXTBOOK OF HISTOLOGY. 5th Edition.

The subject is arranged upon an embryological basis and illustrated by noteworthy drawings. By J. L. Bremer (Harvard)

\$6.50

NEAL AND RAND—COMPARATIVE ANATOMY.

It is designed to correlate and interpret the observations of the student in the laboratory. By H. V. Neal (Tufts) and H. W. Rand (Harvard)

\$4.75

BARNES—TEXTBOOK OF GENERAL PHYSIOLOGY.

The book gives a new and fresh point of view and the author himself is a prolific contributor to the field of general physiology. By T. Cunliffe Barnes (Yale)

\$4.50

LAMBERT—INTRODUCTION AND GUIDE TO THE STUDY OF HISTOLOGY.

It provides a course for students not intending to become histologists but to acquire a knowledge of the subject as a basis for further study of physiology and pathology. By Avery E. Lambert (State Univ. of Iowa)

\$5.00

DAVISON—MAMMALIAN ANATOMY. 6th Edition.

A very clear presentation, well illustrated, for the beginner. Excellent foundation for later course in human anatomy. By A. Davison, Revised by F. A. Stromsten (Princeton)

\$3.00

FOLSOM—ENTOMOLOGY WITH SPECIAL REFERENCE TO ITS ECOLOGICAL ASPECTS. 4th Edition.

The book presents a biological treatment of entomology and the text may be used also as a guide for field work. By J. W. Folsom, Revised by R. A. Wardle (Univ. Manitoba)

\$4.00

WINTON and BAYLISS—HUMAN PHYSIOLOGY. 2d Edition.

It is adapted to advanced college and professional school work. It gives the newer viewpoints in their right proportions. By F. R. Winton (Cambridge) and L. E. Bayliss (Edinburgh)

\$4.50

ROBBINS and RAMALEY—PLANTS USEFUL TO MAN.

2d Edition.

It presents the human interest phases of botany. Economical, cultural, commercial, medicinal, ornamental phases are emphasized. By W. W. Robbins (Univ. of Calif.) and F. Ramaley (Univ. of Colo.)

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Kruif's latest work is eminently worthy of the honor. Departing still further from the personal-historical *motif* which characterized his earlier work, de Kruif has built this work around the medico-scientific problem of social survival. Perhaps in none of his works has the theme been more evident, certainly in none has he spoken with so much conviction and power. More favorably situated than ever before to gather the facts, he unfolds a picture of public ignorance and official stupidity that has, of course, not gone unsuspected, but is all the more humiliating to the reputedly "best educated nation in the world!" The book merits careful reading, and prayerful consideration, "if these things be done in the green wood, . . ."

FLORIDA WILD FLOWERS, MARY FRANCIS BAKER, *The Macmillan Co., New York, 1938. \$3.50.*

Eventually the catalogue of flors for all the states of the Union will be complete. This contribution from the Flower State, is worthy of standing with the best. The copious illustrations give one somewhat of the feeling that Florida after all is semitropical in climate and that here we begin to see some of the floral beauty that goes with the tropical rain-forest and the jungle. One who is familiar with the common *Sarracenias* (Pitcher Plants) of the northern states is bound to be surprised to know that there is a Floridean species, *Sarracenia flava*, with yellow flowers four to five inches across, and trumpet shaped leaves from one to four feet tall! In future editions it would be a gracious assistance to the plant lover if the descriptions of each illustrated species contained a reference to the location of the picture.

THE FOUNDATIONS OF NUTRITION, MARY SWARTZ ROSE, *The Macmillan Co., New York, 1938. \$3.50.*

Taken all in all, this is by far the best book among so many which have been issued this year on the burning question of nutrition. This is not in any sense a "popular" book. It is thoroughly scientific, well-documented and very intelligently organized. It is a reference work which should be on every biological library shelf, as well as in public and high school libraries.

It should make a fine text-book for nutrition courses as well.

GARDEN BULBS IN COLOR, J. H. MCFARLAND, R. M. HATTON, D. J. FOLEY; *The Macmillan Co., 1938. \$3.50.*

Now that Spring is on the way, and garden-minded biologists are muddying themselves in an atavistic return to Mother Earth, there comes to our bookshelves the most exciting book this amateur gardner has yet to see. 275 gloriously vivid color photographs of flowering bulbous plants from *Amaryllis* to *Zephyranthes* riot through the pages of a publication which it will be a joy to possess. The information is well chosen and should be helpful.

GRASSES IN KANSAS, FRANK C. GATES, *State Board of Agriculture, Topeka, Kansas, 1937.*

This valuable manual of the Kansas grasses is not for sale. Those who are professionally interested, however, may procure a copy without charge by writing directly to the Kansas State Board of Agriculture. They will be richly rewarded for doing so. Situated as it is about midway between the northern and the southern floras of the central plains region, Kansas is the meeting ground for practically all the important grasses of the middle West. Treating these forms as carefully and as thoroughly as it does, this book deserves a place in any college library. Librarians, however, will want to have it bound in stouter covers after they once see it.

GUIDE TO THE DESERT PLANT COLLECTION, WILLIAM HERTICH, *Huntington Library and Art Gallery, San Marino, Calif. 1937. \$25.*

Anyone interested in the desert flora of our great Southwest will want to add this attractive and beautifully printed survey of the Huntington Desert Plant Collection to his library shelves.

GERMAN FORESTRY, FRANZ HESKE, *Yale University Press, New Haven, 1938. \$3.00.*

Published for the Oberlaender Trust of the Carl Schurz Foundation, this compendious treatment of German forest methods by the director of the



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Forstliche Hochschule, Tharandt bei Dresden, merits attention. With only four per cent of her available area unclaimed wasteland, Germany has certainly set the world a pace in silviculture. In recent years, however, there has been no single authoritative reference work on the newer German techniques available. This lack of up-to-the-minute information is adequately overcome in this splendid translation of a manuscript which was planned for this type of publication.

HEREDITY AND POLITICS, J. B. S. HALDANE, W. W. Norton & Co., New York, 1938. \$2.50.

The anti-Jewish expulsion and compulsory sterilization laws of Germany, and the eugenic sterilization laws of many of our own American states are taken severely to task by the noted British scientist and author, whose conclusions are significant: "If we hope to be successful in any political or social endeavor there are two prerequisites besides good will. We must examine the system with which we have to deal, and we must examine ourselves. We must find out what we take for granted in the field of social science, and then ask ourselves why we take it for granted, a much more difficult question. We must remember that the investigator, whether a biologist, an economist, or a sociologist, is himself a part of history, and that if he ever forgets that he is a part of history he will deceive his audience and deceive himself."

HOW ANCIENT HEALING GOVERNS MODERN THERAPEUTICS, K. LIGEROS, G. P. Putnam's Sons, New York, 1937. \$10.00.

Perhaps the most valuable contribution to our general knowledge of the history of medicine,—or of biology, for that matter,—comes to us from modern Greece. Dr. Ligeros, a widely educated physician of American origin, was handicapped in the early stages of his career by a deformity which slowly yielded to therapy. During this period he became interested in the causes and effects, as well as treatment used, in modern diseases as compared to the same problems in the days of the ancient Greeks. His findings are more extensive, interesting, and in some

cases startling, than the most sanguine would be led to expect. This book is automatically assigned to the required list in the library section devoted to the history of biology and medicine.

HUMAN AFFAIRS, Edited by R. B. CATTELL, J. COHEN, AND R. M. W. TRAVERS, *The Macmillan Co., New York, 1937. \$4.25.*

This is one of the most difficult books to analyze and classify that has come to the reviewer in years. Fifteen different English authors have been induced by the editors to contribute their separate studies on the problems of human society, each from his own viewpoint, and as he sees them. The result is an unusually interesting volume, perhaps more interesting to the sociologist than the scientist, but unquestionably stimulating.

KOALA, CHARLES BARRETT, *Robertson & Mullens, Melbourne, Australia, 1937. 2/-*

This story of Australia's native bear is much shorter and less scientific than the Ambrose Pratt volume also reviewed in this issue. As a delightful gift book it would have few equals. Practically every other page of this slim volume is devoted to some of the most attractive photography that has come our way in months. The book, its interesting story, and its lovely animal portraiture, must be seen to be appreciated.

LABORATORY DIRECTIONS IN COLLEGE ZOOLOGY, HENRY LANE BRUNER, *Macmillan Co., New York, 1938. \$1.75.*

This is the most ambitious and practical laboratory manual for zoology classes that has appeared in recent months. The author evidently believes in thoroughness, a propensity not too often met with now-a-days. While the book is particularly appropriate for use with Hegner's "College Zoology", it will prove useful with almost every other zoological text. After all, why should it not be just as practical to let a student study from one text, and perform his experiments from another, as to let him take his lectures under one university professor, and his laboratory and quizzes from others?

THE LONDON ZOO, E. G. BOULENGER,
E. P. Dutton & Co., New York, 1937.
\$2.00.

Aside from its interest as another animal book by an internationally known authority, this work by the Curator of Reptiles in the Zoological Society's gardens, affords an interesting study of animal ecology under abnormal conditions. It is worth reading, and will be a particularly good gift book for curious young people.

THE MAYO CLINIC, LUCY WILDER,
Harcourt Brace & Co., New York,
1938. \$1.50.

This thoroughly illustrated brochure gives an excellent thumb-nail sketch of the history, organization and operation of the celebrated Minnesota clinic of the Doctors Mayo, through which at least a million patients have passed and some 700 additional register daily.

METHODS IN PALEONTOLOGY,
CHARLES L. CAMP and G. DALLAS
HANNA, University of California
Press, Berkeley, 1937. \$2.50.

Now that paleontology has discovered that this continent has more than the long unsuspected little to offer to the story of prehistoric life, paleontological investigation has gone ahead by leaps and bounds. The new volume under discussion aims to cover the preliminary preparations and techniques necessary for successful fossil hunting. The first part of the work (by C. L. Camp) has to do with vertebrate exploration, the second (by G. D. Hanna) deals with macro- and microfossil invertebrates.

MOON MYTHS AND MAN, H. S. BEL-
LAMY, Harper and Brothers, New
York, 1938. \$3.00.

Basing his calculations on the not altogether credible Cosmic Ice Theory of Hans Hoerbiger, according to whom the earth captured a foot-loose planet called Luna, and turned it into our moon, with much internal and external upheaving and terrestrial liquidation,—the author of this work weaves into a more or less connected and convincing whole the multitudinous moon myths of all the ages and races on men. It makes interesting reading, whether you accept it not.

THE NEGRO'S STRUGGLE FOR SUR-
VIVAL, S. J. HOLMES, University of
California Press, Berkeley, 1937.
\$3.00.

This work is a carefully authenticated and heavily documented ecological study in human populations. As such it attains first rank as sociology from the ecological approach. People who talk glibly and blindly about the colored problem should read this book carefully, not omitting the author's concluding considerations. Ecologists who are looking for material on the human side of an overly subdivided branch of biological science, will find much to interest them too.

ON A NEW GLAND IN MAN AND
SEVERAL MAMMALS, IVAR SAND-
STROM, Johns Hopkins Press, 1938.
\$1.00.

Those who are interested in the history of biological science will welcome the excellent translations of epoch-making scientific papers which are emanating from the Johns Hopkins University Press. The present volume reproduces the original paper by Ivar Sandstrom in which he announced his discovery of the parathyroid glands. Buried for years in a Swedish publication of the University of Upsala dating back to 1879-90, it has now for the first time been published in English with the original illustrations. The idea of this sort of thing is excellent. Orchids to the Johns Hopkins Press for doing it. Why didn't some other University get the bright idea long ago?

ON THOUGHT IN MEDICINE, HER-
MANN VON HELMHOLTZ, Johns Hop-
kins Press, Baltimore, 1938. \$.75.

This is a beautifully simple reprint of a memorial address delivered at the anniversary celebration of the foundation of the institute for the education of Army surgeons, by the great physiologist and physicist, Hermann von Helmholtz. It is a vigorous critique of the older medical teaching which clung to books as opposed to experimentation and reflective research.

THE ORIGIN OF LIFE, A. I. OPARIN,
The Macmillan Co., New York, 1938.
\$2.75.

The Associate Director of the Biochemical Institute, U.S.S.R. Academy

of Science, attacks the problem of life's origin which has thus far defied solution by laboratory methods, in a very objective and cautious fashion. Utterly denying the possible existence of any "vital energies" the author concludes that there is no fundamental difference between living organisms and lifeless matter. His final conclusions as to the possibility of a chemical synthesis of living matter is strangely reminiscent of the stories one hears of similar statements by the lamented Jacques Loub, who also attacked this problem. The original Russian of the Author has been very readably translated by Sergius Morgulis of the University of Nebraska College of Medicine.

PHYSIOLOGICAL GENETICS, RICHARD GOLDSCHMIDT, McGraw-Hill Book Co., New York, 1938. \$4.00.

Attacking genetic problems from a physiological angle was perhaps inevitable. It remained for Dr. Richard Goldschmidt of the University of California to do so, and thereby probably found a new branch of science. The chapters of the book are divided under three main headings,—the Mutated Gene and the Potentialities of Development, the Cytoplasm and the Activation of the Gene, and the Nature of the Gene. There is a useful and comprehensive 44-page bibliography. All in all, this work is destined to introduce a new accent into genetic studies. It should therefore appear promptly on the shelves of every biological library.

PLANT ECOLOGY, J. E. WEAVER and F. E. CLEMENTS, McGraw-Hill Book Co., New York, 1938. \$5.00.

This is a much needed second and revised edition of an ecological textbook which has become a near-classic in its field. Brought up-to-date in every respect, it will win new friends and hold its old ones.

PLANT PROPAGATION AND ORCHARDING, G. W. ADRIANCE and F. R. BRISON, Edwards Brothers, Ann Arbor, Mich., 1937. \$1.50.

This lithoprinted book looks practical enough to warrant its subsequent publication in the usual form. The subjects covered range through the natural and artificial means of sexual and vegetative plant reproduction, the tech-

niques generally employed in orcharding, with a special chapter on fruit growing in Texas. If the authors would expand this one purely localized reference to cover all similar areas, either arid, or southern, or whatever Texas is supposed to be, there should be a healthy market for such a work.

RETREAT FROM REASON, L. T. HOGGEN, Hampshire Bookshop, Northampton, Mass., 1937.

Politely pink lectures in which the evils of Fascism are carefully and objectively contrasted with the liberties of Communism, by the noted Englishman, Lancelot T. Hogben, before the South Place Ethical Society of London. Julian Huxley writes the introduction, Isabel S. Stearns of Smith College supplies the footnotes. Hogben styles himself a scientific humanist, and the retreat from reason of which he speaks would seem to be the Fascist tendency of modern dictatorships.

SCIENTIFIC ILLUSTRATION, JOHN L. RIDGWAY, Stanford University Press, Stanford University, California, 1938. \$4.00.

Anyone who has attempted to illustrate a biological manuscript with anything else than photographs has, perhaps, cursed the day he did not pay better attention to the principles in drawing which he studied in grade school, if he were so fortunate as ever to have had the chance. Here is a very complete and well-written solution to such a one's difficulties. It will be of real value to all scientists, not only biologists. It will be particularly valuable to artists, both scientific and commercial. To say that it should be on the biology library's shelves is putting it mildly.

SEASON OF BIRTH, ELLSWORTH HUNTINGTON, John Wiley & Sons, New York, 1938. \$3.50.

The author started out to find if there were any sort of seasonal reproductive cycle among humans such as has been observed in the rest of the animal world. He discovered that conceptions reach their peaks in the U.S.A. in the months of February and August, and that births are correspondingly more numerous in October-November

and May-June. In other lands, notably European, these same cycles do not hold. His explanations for these variations are interesting, and fairly convincing. One wishes that he had made similar studies of these seasonal cycles below the equator, in South America, the Cape Colonies and Australia. It would have gone far to substantiate or wreck his theory. All in all, the book is stimulating reading, and deserves study.

SOCIAL HYGIENE, W. B. LONG and J. A. GOLDBERG, *Lea and Febiger, Philadelphia, 1938. \$4.00.*

Surgeon-General Parran has found a valuable ally in his war on social disease, in the present text, which is a composite of some twenty-odd chapters each by a different medical or social-disease authority. Few people will want to read it, altho there are hundreds of thousands who ought to be made to do so. The few that do read it will lay it down, wiser, if not better men. Referring to its contents, its introducer, Dr. Edward L. Keyes, mentions "the horrors these pages detail." The good Doctor is guilty of understatement. It would give the average, unsuspecting and clean-minded layman the "willies."

SO YOU THINK IT'S NEW, WILFRED J. FUNK, *Funk and Wagnalls Co., New York, 1937. \$2.00.*

As a lexicographer of no mean ability, Wilfred J. Funk has had ample opportunity to come across more unusual things in nature, art, history and philosophy than almost any other person one could name. This book might therefore be called a by-product of lexicography. No matter what you call it, if you season your science with silliness, you'll like it. You'll buy it, and your friends will borrow it. So what?

STRANGE BIRDS AND THEIR STORIES, A. HYATT VERRILL, *L. C. Page Co., Boston, 1938. \$2.50.*

Indefatigably searching for the unusual in the animal world, A. Hyatt Verrill is becoming a sort of Ripley to the "Believe it or Not's" of biology. There are those hardy spirits in the scientific world who "don't hold with this sort of thing," but they are, for-

tunately, few and far between, Mr. Verrill writes from experience, not from hearsay. As a result this volume is no less interesting than his previous ones. Of particular interest is his fine chapter on "Birds that Have Vanished." It is an arresting episode in a very readable book.

THE STRUCTURE AND DEVELOPMENT OF THE FUNGI, H. C. I. GWYNNE-VAUGHAN and B. BARNES, *Cambridge University Press, The Macmillan Co., New York, 1938. \$5.50.*

The first edition of this standard reference appeared in 1926. It was reprinted with additions in 1930. In this, the second edition, it appears as a new book with considerable revision to bring it up to date, with numerous new illustrations as well. The introductory portions of the book are particularly useful, with their descriptions of the general characters of the fungi and their life histories, the discussions on saprophytism, parasitism and symbiosis, as well as the reactions of fungi to stimuli. Equally practical are the concluding sections on mycological technique.

THE TOLOWA AND THEIR SOUTHWEST OREGON KIN, PHILIP DRUCKER, *University of California Press, Berkeley, 1937.*

The ethnogeography, culture, customs, individual life, and the religion and ritual observance as far as it existed in the memory of surviving members of the Athabaskan tribes of northwestern California and southwestern Oregon.

TREES OF NORTHEASTERN UNITED STATES, H. P. BROWN, *The Christopher Publishing House, Boston, 1938. \$3.00.*

This is revised and enlarged edition of a helpful manual of the native and naturalized trees of New York and its surrounding states. Since many, if not most of these trees are to be found throughout the rest of the states the book should have a wide appeal. It is attractively but not too expensively gotten up.

VERTEBRATE ZOOLOGY, HENRY SHERRING PRATT, *Ginn & Co., Boston, 1938. \$2.20.*

This is a third edition of a textbook of comparative vertebrate anatomy so

well known in collegiate circles that it has almost become a classic. In addition to the optional dissection of the rabbit, preferred by many to the cat, which appeared in the second edition, this new revision contains directions for the dissection of the *Amphioxus* and *Petromyzon*, the cyclostomate lamprey. These additions will round out the serviceability of the book.

VIRGINIA TREES, WILLIAM HARRISON LAMB, *Manassas Journal Press, Manassas, Va., 1937.*

Ye Editor of The Manassas Journal in the sovereign state of Virginia has something better to think about than the political state of the nation, or even of Virginia. He is that *rara avis* among the journalistic profession, a man of culture and a hobby. His hobby is trees, and he has begun a most laudable departure in journalese, by writing a taxonomy of the trees of his state. This first volume is devoted to the conifers. The preliminary chapter

on Forest Types is particularly informative. So also is the author's laudable attempt to eliminate as far as possible the technical terminology of the professional which is only serving as a bar and blockade to an intelligent public interest in conservation problems.

WORLD NATURAL HISTORY, E. G. BOULENGER, *Charles Scribner's Sons, New York, 1938. \$3.00.*

This comprehensive and "elegantly" illustrated volume really merits the concluding words of the introduction by H. G. Wells: "I commend this clear and stimulating procession Mr. Boulenger has marshalled to the family library with all my heart. It is a book to own. It is a book to give as a present. It is a book to give as a prize. No young gentleman's library, at any rate, should be without it." Working from the mammals down to the protozoa, it gives an always interesting survey of the entire animal kingdom. An excellent book for school libraries.

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